Section 3 Affected Environment and Environmental Consequences

3.1 *Surface Water Resources*

3.1.1 Affected Environment

The Sacramento River and Stony Creek are the two primary surface water features in the APT study area (Figure 6). The Sacramento River drains the north central portion of California, including the western slope of the Sierra Nevada, the southern slope of Mount Shasta and the eastern slope of the Coast Range. It has a total length of 384 miles and is California's longest and largest river, carrying nearly one-third of the state's total water runoff. The federal Central Valley Project's (CVP) Lake Shasta is the principal impoundment on the River. It is located north of the city of Redding and has a capacity of 4.5 million acre-feet.

Stony Creek is tributary to the Sacramento River near Hamilton City, draining the east slope of the Coast Range. Its flows are regulated by three reservoirs. East Park and Stony Gorge Dams and Reservoirs were constructed in the early 1900's as part of the federal Orland Project. They have capacities of about 50,000 acre-feet each and release stored water for irrigation within the Orland Project. Black Butte Dam and Reservoir were constructed by the Corps of Engineer in the early 1960s primarily for flood control. Black Butte is financially integrated and operationally coordinated with the two Orland Project reservoirs.

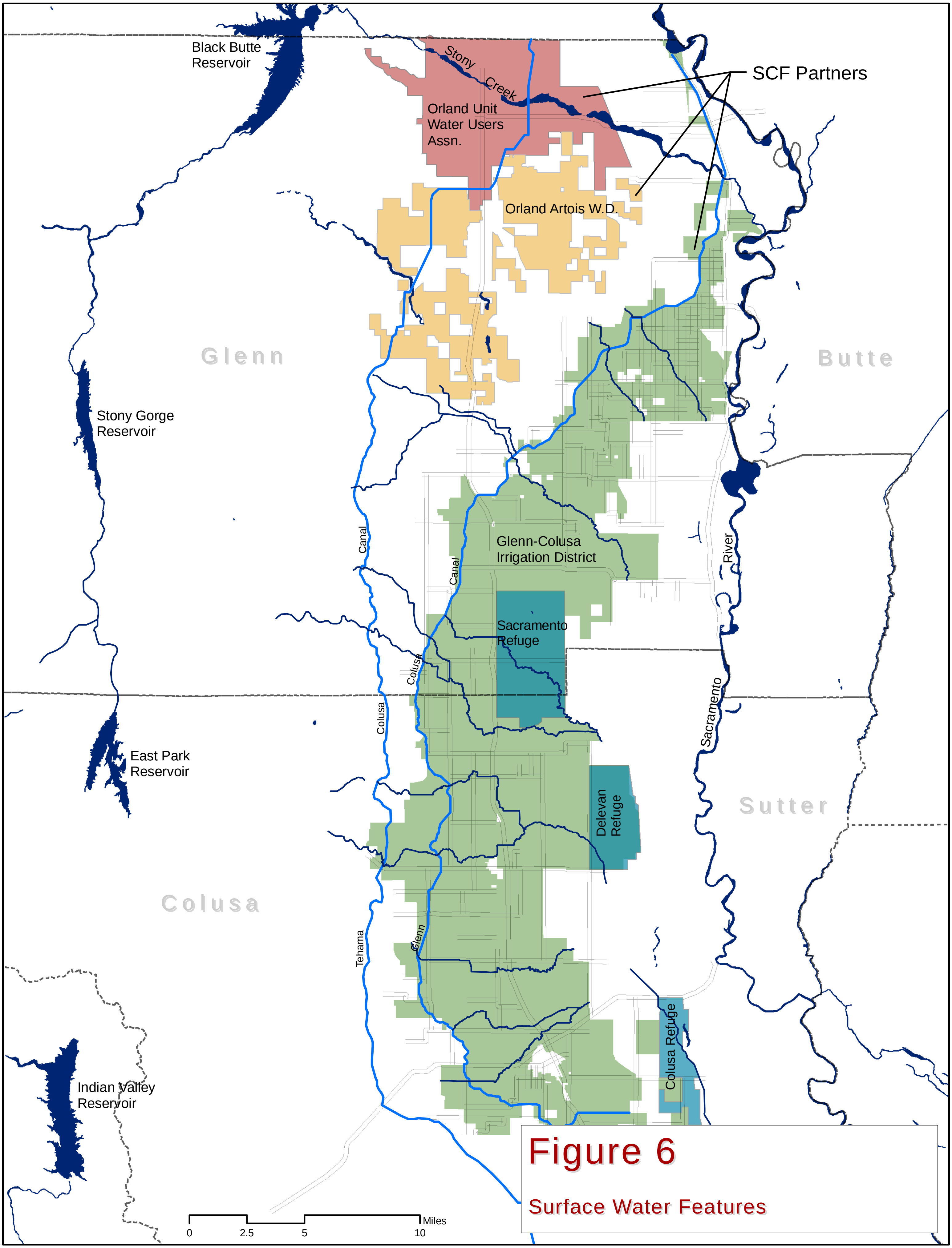


Figure 6

Surface Water Features

3.1.1.1 Glenn-Colusa Irrigation District

GCID is the largest irrigation district in the Sacramento Valley with about 141,000 acres of agricultural land and 20,000 acres of managed waterfowl habitat with a gross service area of about 175,000 acres. GCID's main surface water facilities include the 3,000 cubic feet per second (cfs) Sacramento River Pump Station located north of Hamilton City, a 65-mile main canal, and about 900 miles of distribution laterals and drains.

The Sacramento River is GCID's primary water supply source. GCID holds pre- and post-1914 water rights to divert natural flow from the River. Pursuant to a negotiated agreement (settlement contract) with Reclamation, GCID may divert up to 825,000 acre-feet annually from the Sacramento River, including 720,000 acre-feet of base supply and 105,000 acre-feet of CVP project water. GCID also holds water rights to divert water from various other streams, including Stony Creek and the Colusa Basin Drain. Water supplied by GCID is used for irrigation, rice straw decomposition and maintenance of water fowl habitat. GCID does not provide water for municipal or industrial uses.

3.1.1.2 Orland-Artois Water District

OAWD was formed in 1954 for the purpose of contracting with the Bureau of Reclamation (Reclamation) for a supplemental surface water supply from the CVP. The District consists of 28,988 gross acres interspersed with non-District lands in a checkerboard-like pattern. The District's CVP water supply contract is for a maximum of 53,000 acre-feet annually, subject to shortages as determined by Reclamation. Because the demand for surface water typically exceeds the available contract supply, the District purchases additional surface water supplies in most years under short-term water transfer provisions, depending on availability and price, to augment available contract supplies. All water is delivered for irrigation. OAWD does not provide water for municipal or industrial uses.

The District water distribution system consists of about 100 miles of buried pipelines ranging in diameter from 8 to 96 inches. It was constructed over the period 1976 through 1983. The system is supplied from five permanent and three temporary turnouts from the Tehama-Colusa Canal (TCC), with a combined delivery capacity of about 427 cfs. About 16,767 acres are located down-gradient from the TCC and are served by gravity. The remaining 12,221 acres are up-gradient and are served by electrically powered canal side pumping plants. Water deliveries began in 1977.

3.1.1.3 Orland Unit Water Users Association

The Orland Unit Water Users Association (OUWUA) is a non-profit California Corporation formed in 1906. The OUWUA successfully petitioned Reclamation (then the United States Reclamation Service) to develop the Orland Project, construction of which began in 1909. East Park Dam and Reservoir were completed in 1910, and Stony Gorge Dam and Reservoir were completed in 1928. Operation of East Park Reservoir and Stony Gorge Reservoir is coordinated with operation of the Corps of Engineers Black Butte Reservoir located downstream as needed to meet irrigation demands within the Orland Project. An average of 100,000 AF of surface water is distributed through 17 miles of open main canals and 137 miles of open laterals for irrigation of about 17,600 acres within the OUWUA's 20,200 acre area. OUWUA does not provide water for municipal or industrial uses.

3.1.2 Environmental Consequences

3.1.2.1 No Action

Under the No Action alternative, the SCF Partners would continue to divert and distribute surface water in the respective operations as they have historically, pursuant to the water right and contractual terms governing their respective surface water supplies. Individual water users would continue to use water the way they presently do.

3.1.2.2 Proposed Action

Under the proposed action, each of the SCF Partners would operate their surface water distribution systems as they ordinarily do, but with the groundwater produced from the test-production wells included in system operation. There would be no modification of the surface water distribution systems or change in service areas. Phase 1 and Phase 2 pumping would not interfere with irrigation season surface water deliveries. Groundwater produced during Phase 1 and Phase 2 testing would be used to meet demands to the extent possible, as these test phases are scheduled to occur outside the irrigation season when demands are low. Any test water that could not be used for irrigation would be stored in canals or delivered to fallow fields and used for groundwater recharge.

In the test Phase 3, the test-production wells would be operated during two consecutive irrigation seasons, following completion of Phase 2 testing. This would allow all groundwater produced during this test phase to be delivered to water users. No water would be delivered outside of the service areas of the SCF Partners, either directly or through exchange. In GCID and OUWUA, assuming the availability of a full surface water supply during Phase 3 of the proposed action, surface water diversion and use would be reduced by the amount of groundwater pumped for testing. In the event that surface water supplies are limited due to dry hydrologic conditions, all the groundwater pumped by GCID and OUWUA for Phase 3 test purposes would be used to augment available surface water supplies. OAWD typically experiences surface water shortages nearly every year, so groundwater pumped for test purposes would expand the total quantity of water provided by the district, reducing the amount of groundwater pumped by landowners to augment the district water supply by approximately 6,000 acre-feet. Table 4 provides the total supplies made available for each phase of the project.

During the two irrigation seasons for Phase 3, GCID's surface water diversions could be augmented by up to 23,865 acre-feet. If GCID receives a 100% allocation from Reclamation, surface water not diverted by GCID would be available for diversion by other surface water users in the basin, would provide in-stream benefits, or would contribute to Delta needs, depending on flow timing. If Reclamation imposes a 25% allocation reduction, GCID's supply would be reduced by 206,250 acre-feet and the groundwater from test Phase 3 could be used to partially offset the shortage. The changes would not adversely impact surface water resources.

In OAWD, surface water supplies are generally not sufficient to meet surface water demands, so reductions in surface water use would not occur. Instead, surface water deliveries would be augmented with groundwater. Groundwater pumping would supplement OAWD's CVP contract supply by providing an additional 6,000 acre-feet of water. The extra water would be used for agriculture. The increase would not adversely impact surface water resources.

In OUWUA, following test Phase 2, the test-production wells would be connected to the District's open canal system, making it possible to deliver the groundwater to District water users. The approximately 14,800 acre-feet of groundwater produced during test Phase 3 (2 seasons at 7,400 acre-feet per season) would be used to augment available surface water supplies during the irrigation season. This would result in a reduction in releases of stored surface water from East Park and Stony Gorge Reservoirs. Stored water would be used for Orland Project supply in subsequent years or to augment Stony Creek flows, depending on flow timing. The changes in surface water deliveries would not result in adverse impacts to surface water resources.

The SCF APT is a limited study designed to enhance understanding of the Sacramento Valley aquifer system in the study area. Pumping is geographically limited to the specified wells in the SCF APT study area and specified intervals within a two-year study period. The total volume of pumping is a small proportion of the existing pumping in the area, and some of the SCF APT test pumping would offset groundwater pumping from shallower parts of the aquifer. Review of the baseline data indicates that groundwater levels, groundwater quality and land subsidence rates in the area are stable. Baseline aquifer test results from the existing GCID test-production well showed that pumping below 700 feet had no measurable effect on groundwater elevations in the shallower parts of the aquifer. Therefore, no measurable effects on stream flow, riparian habitat or wetland habitat are anticipated

3.1.2.3 Cumulative Impacts

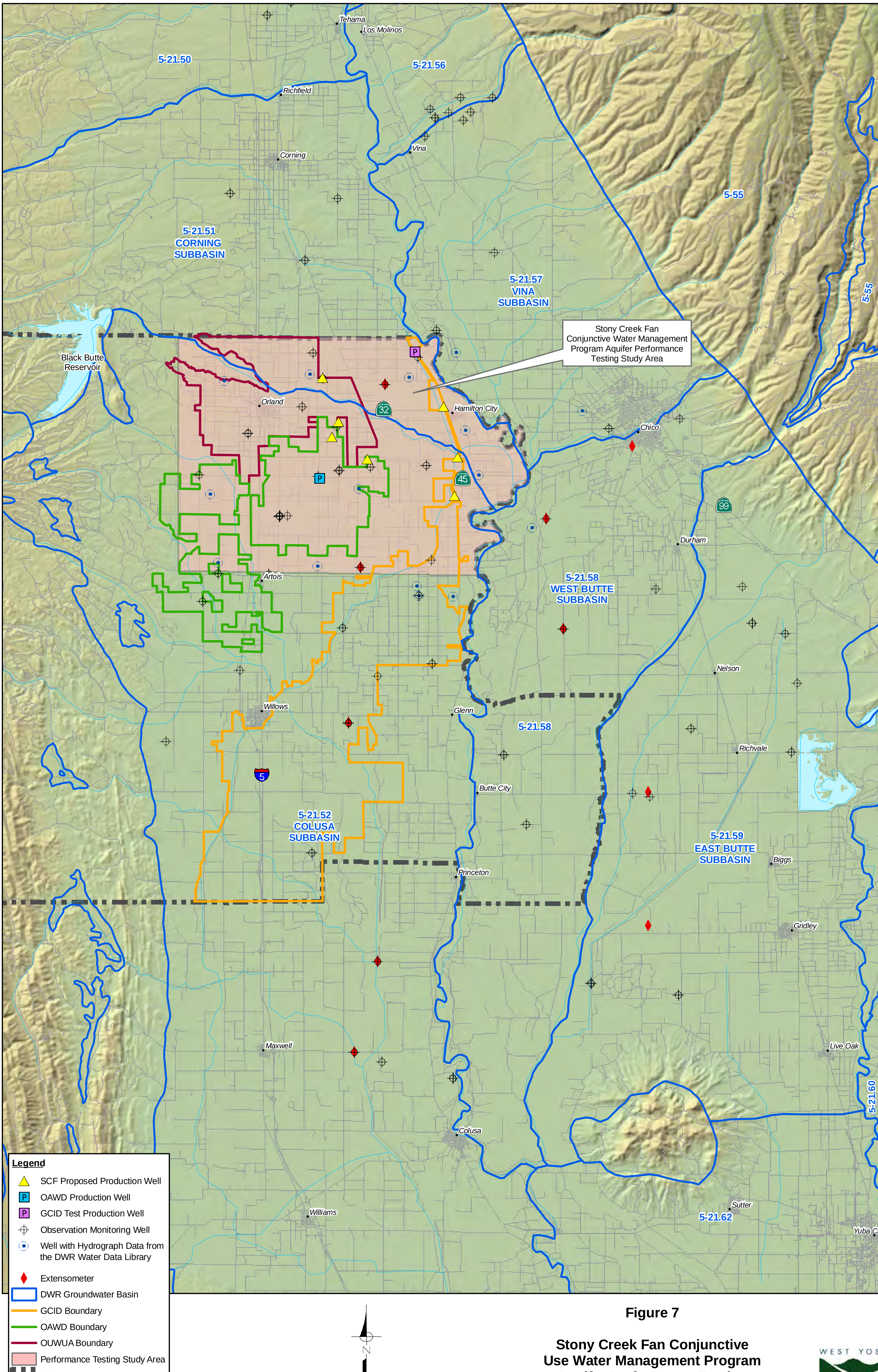
The proposed action would not contribute to cumulative impacts because of the limited duration and the fact that no adverse impacts to surface water resources would result from the implementation of the APT.

3.2 *Groundwater and Geologic Resources*

3.2.1 Affected Environment

Figure 7 shows the location of the SCF APT Study Area in relation to the Sacramento Valley and other regional geographic features. The SCF APT Study Area is located in the northern Sacramento Valley and is approximately delineated by the Glenn-Tehama County line to the north, the Sacramento River to the east, Township line T20N to the south and Range line R3W to the west. Following the nomenclature of DWR's Bulletin 118, the SCF APT Study Area lies within the northern portion of the Colusa Subbasin (#5-21.52) and the southern portion of the Corning Subbasin (5-21.51) of the Sacramento Valley Groundwater Basin of the Sacramento River Hydrologic Region (DWR, 2004). The Vina Subbasin (5-21.57), and West Butte Subbasin (5-21.58) are located to the northeast and southeast of the study area respectively. DWR's description of the sub-basins can be found at http://www.groundwater.water.ca.gov/bulletin118/.

The proposed test-production wells would be screened in the lower part of the fresh water aquifer system at anticipated depths greater than approximately 700 feet. Few water wells have been constructed to depths greater than 700 feet, and detailed stratigraphic information from this depth to the base of the fresh water aquifer system is very limited. The base of fresh groundwater in the study area occurs at approximately -1,200 to -1,600 feet below sea level in the SCF APT Study Area (DWR, 1978). One of the goals of the SCF APT is to collect additional detailed geologic and geophysical information by drilling of the test holes that would help to refine the understanding of the freshwater aquifer system, focusing on depths greater than 700 feet. The California Department of Water Resources, Department of Planning and Local Assistance (DWR), Northern District has completed several test borings and monitoring wells to the base of fresh water and was involved in the construction and aquifer testing of a test-production well located at the GCID pump station (Figure 7).



NOTE: GCID Boundary extends south into Colusa County. The portion of the boundary in Colusa County is not shown on this figure.

Figure 7

Stony Creek Fan Conjunctive Use Water Management Program Aquifer Performance Testing

AQUIFER PERFORMANCE TEST STUDY AREA

WEST YOST ASSOCIATES
Consulting Engineers

The Sacramento Valley in the vicinity of the APT Study Area is filled by a thick sequence of marine sedimentary rock of Late Jurassic (159 million years before present [my]) to Eocene (34 my) age, unconformably overlain by a relatively thin sequence of continental sedimentary deposits of Pliocene (5 my) and younger age (Harwood and Helley, 1987).

The older marine rocks contain saline water. The freshwater aquifers in the vicinity of the APT study area occur in the overlying continental sedimentary deposits, which are presented from oldest to youngest in the following discussion. Figure 8 is a geologic map encompassing the APT study area and vicinity. Figure 9 is a geologic cross section that provides a conceptual overview of the freshwater portion of the aquifer system in the vicinity of the APT study area.

3.2.1.1 Hydrogeology of the Apt Study Area

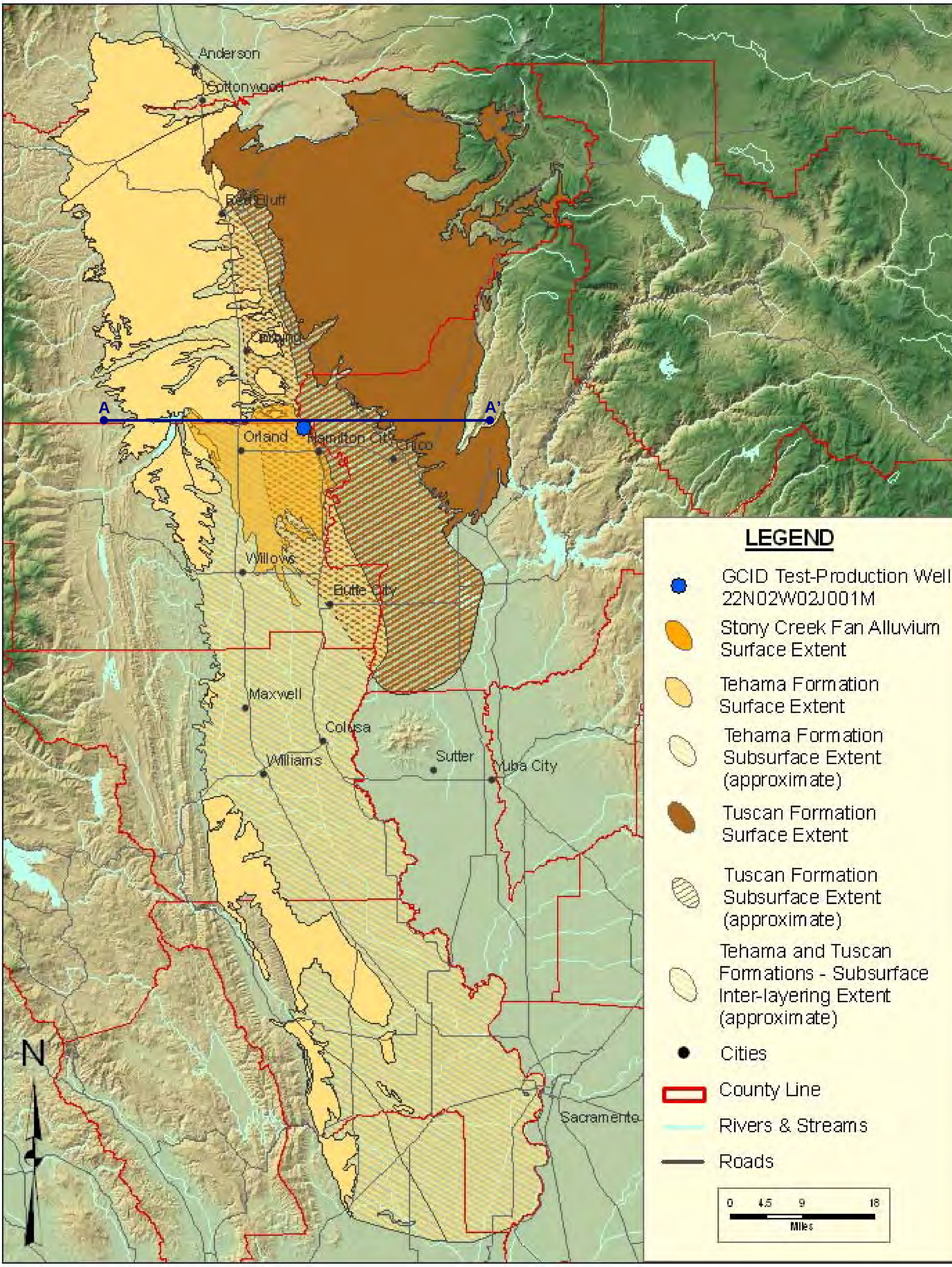
Three main aquifer-bearing geologic formations were logged in the test-production and observation boreholes: the Tuscan Formation, the Tehama Formation, and the Stony Creek Fan alluvium. Domestic, irrigation, and observation wells in the area are screened in one or more of these zones. The fresh-to-brackish Upper Princeton Valley fill underlies the Tuscan and Tehama formations in the study area. Figure 8 shows the surface and approximate subsurface extent of the Tuscan Formation, the Tehama Formation, and the Stony Creek Fan alluvium in the Sacramento Valley and Figure 9 shows a conceptual cross section through the study area.

Upper Princeton Valley Fill
The older Miocene-age Upper Princeton Valley fill is not exposed at the surface and is only encountered in drill holes underlying the Tuscan and Tehama formations in the Sacramento Valley. It consists of non-marine fluvial sediments composed mostly of sandstone, but includes frequent interbeds of pelite and occasional conglomerate and conglomeratic sandstone. Water contained within the Upper Princeton Valley fill ranges from fresh to brackish.

Tuscan Formation
The Pliocene-age Tuscan Formation is exposed in the Cascade Range and along the eastern side of the Sacramento Valley from about Oroville to Redding. It extends below the surface west of the Sacramento River, where it is encountered in bore holes from about 200 ft-bgs to about 1,300 ft-bgs. The geologic source area for the Tuscan Formation is the Cascade Range; sediments are composed of unconsolidated volcanic sand and gravel, as well as consolidated lahar material. Over time, ancient streams and rivers eroded channels into the lahars and were filled with transported and reworked volcanic erosional material. Subsequent lahars flowed over these areas, providing confining layers for the volcanic sand and gravel deposits. The majority of wells on the east side of the Sacramento Valley are screened in, and derive their water from, these confined, channelized aquifer zones.

Tehama Formation
The Tehama Formation is exposed on the west side of the Sacramento Valley, from Redding south to Vacaville, and east to the Sacramento River. Pliocene-age metamorphic sand, gravel, sandstone, and clay make up the sediments of the formation. The Tehama Formation consists of sediments that eroded and were transported from the Coast Range and Klamath Mountains to the west and

north. These coarse- and fine-grained sediments were transported and deposited mainly by water during respective wet and mild climatic cycles. As such, gravel and sand lenses are generally discontinuous throughout the Tehama Formation and are separated by thick layers of clay. Water within these lenses is the primary source of water for wells in the western and central portions of the northern Sacramento Valley.



Source: California Department of Water Resources, Northern District. Provisional Data.

Geologic Cross Section A – A'

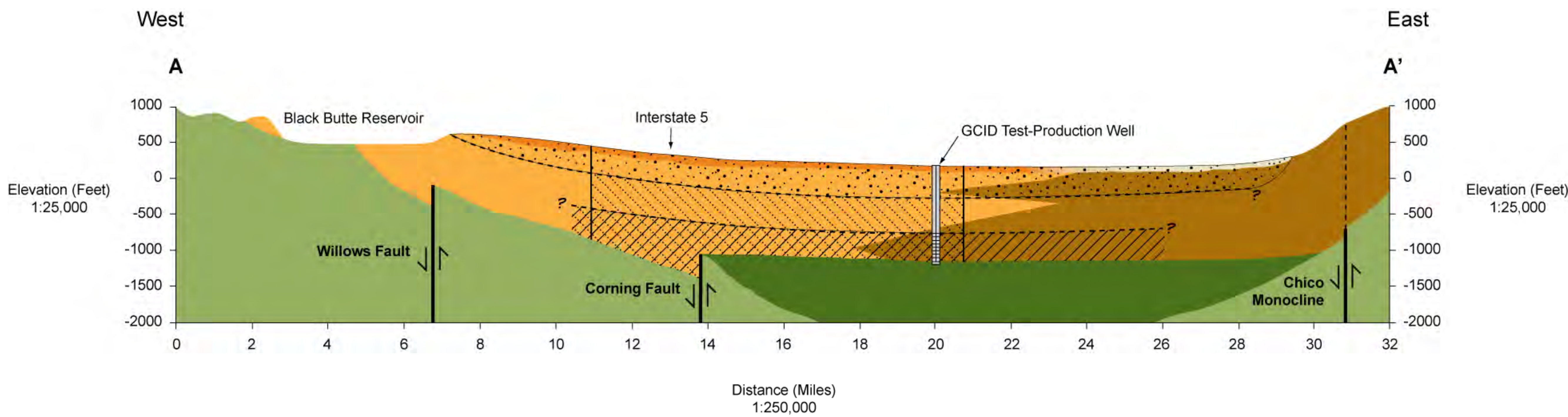
A —————— A'

Figure 8

Stony Creek Fan Conjunctive Use Water Management Program
Aquifer Performance Testing

GEOLOGIC MAP

WEST YOST ASSOCIATES
Consulting Engineers



- Stony Creek Fan Alluvium
- Tehama Formation
- Tuscan Formation
- Alluvium
- Valley Fill
- Basement Rocks
- Stony Creek Fan Aquifer Performance Test Study Area
- Stony Creek Fan Aquifer Performance Test Depth of Focus
- Typical Agricultural and Domestic Well Depth Range
- Fault

Source: California Division of Mines and Geology, Geologic Map of California, Ukiah Sheet and Chico Sheet and California Department of Water Resources, Northern District, Provisional Data

Figure 9

Stony Creek Fan Conjunctive Use Water Management Program
Aquifer Performance Testing

GEOLOGIC CROSS SECTION A-A'

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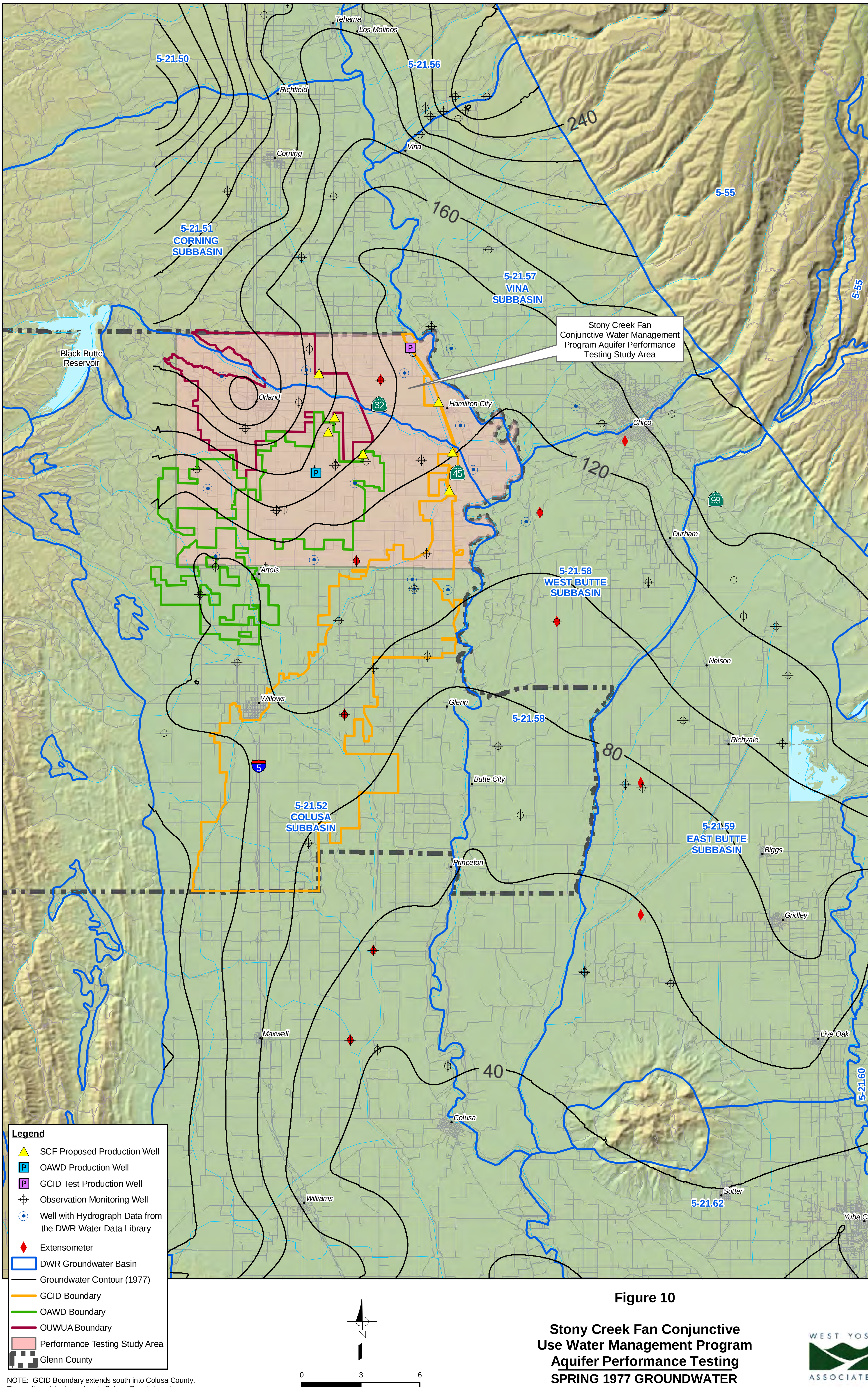
Interlayering between Tuscan and Tehama Sediments
Evidence of the interlayering of Tuscan and Tehama Formation sediments has been seen in lithologic cuttings from exploratory boreholes drilled in Glenn County as far west as Road P, about 8 miles west of the Sacramento River. In general, interlayering of the Tuscan and Tehama sediments occurs more frequently near the Sacramento River; to the west, Tuscan sediments typically underlie Tehama sediments until the Tuscan is eventually pinched out. Where interlayering does occur, there are also zones where Tuscan and Tehama sediments intermix. Lithologically, these areas of intermixing make it difficult to label the sediments with one formation name or the other. However, the aquifer zones within these areas are usually good water producers.

Stony Creek Fan Alluvium
The Stony Creek Fan alluvium in Glenn County extends generally from the Glenn-Tehama County Line in the north to around Road 30 in the south and from the Orland Buttes at Black Butte Reservoir east to the Sacramento River. The Quaternary-aged alluvium is composed mainly of metamorphic gravel and sand with lenses of clay, indicating a Coast Range source area. Sediments were deposited primarily during flood and storm events. Many domestic and shallow irrigation wells pump water from the water-bearing sediments of this unconfined aquifer.

3.2.1.2 Baseline Groundwater Level Conditions

Baseline groundwater conditions were assessed using groundwater level data from the DWR Water Data Library at http://wdl.water.ca.gov/gw/. The locations of wells with groundwater level records at the water data library are shown on Figure 4. Figures 10 through 12 show spring-season groundwater elevation contours for the range historical wet and dry years in the study area. Appendix C provides groundwater hydrographs of wells selected to give representative spatial coverage of the study area over the longest period of time.

Generally, groundwater flow is from the margins of the Sacramento Valley toward the Sacramento River and Sacramento-San Joaquin Delta. Groundwater elevations in the study area are relatively high due to recharge from Stony Creek. Figures 10 and 11 bracket the range of spring season groundwater elevations in the study area. Figure 10 shows the groundwater elevation contours for 1977, which was one of the driest years on record. Figure 11, shows the groundwater elevation contours for 1983, which was one of the wettest years on record. The groundwater elevation differences between the spring 1977 and spring 1983 ranged from approximately 20 to 50 feet, but the overall pattern of groundwater flow was very similar. Figure 12 shows the groundwater elevation contours for spring 2008. Comparison of the Figures 11 and 12 shows that groundwater elevations and flow directions were very similar between spring 1983 and spring 2008. Groundwater elevations showed more apparent spatial variability in the study during spring 2008 because the contouring is based on a denser network of wells than was available in 1983.



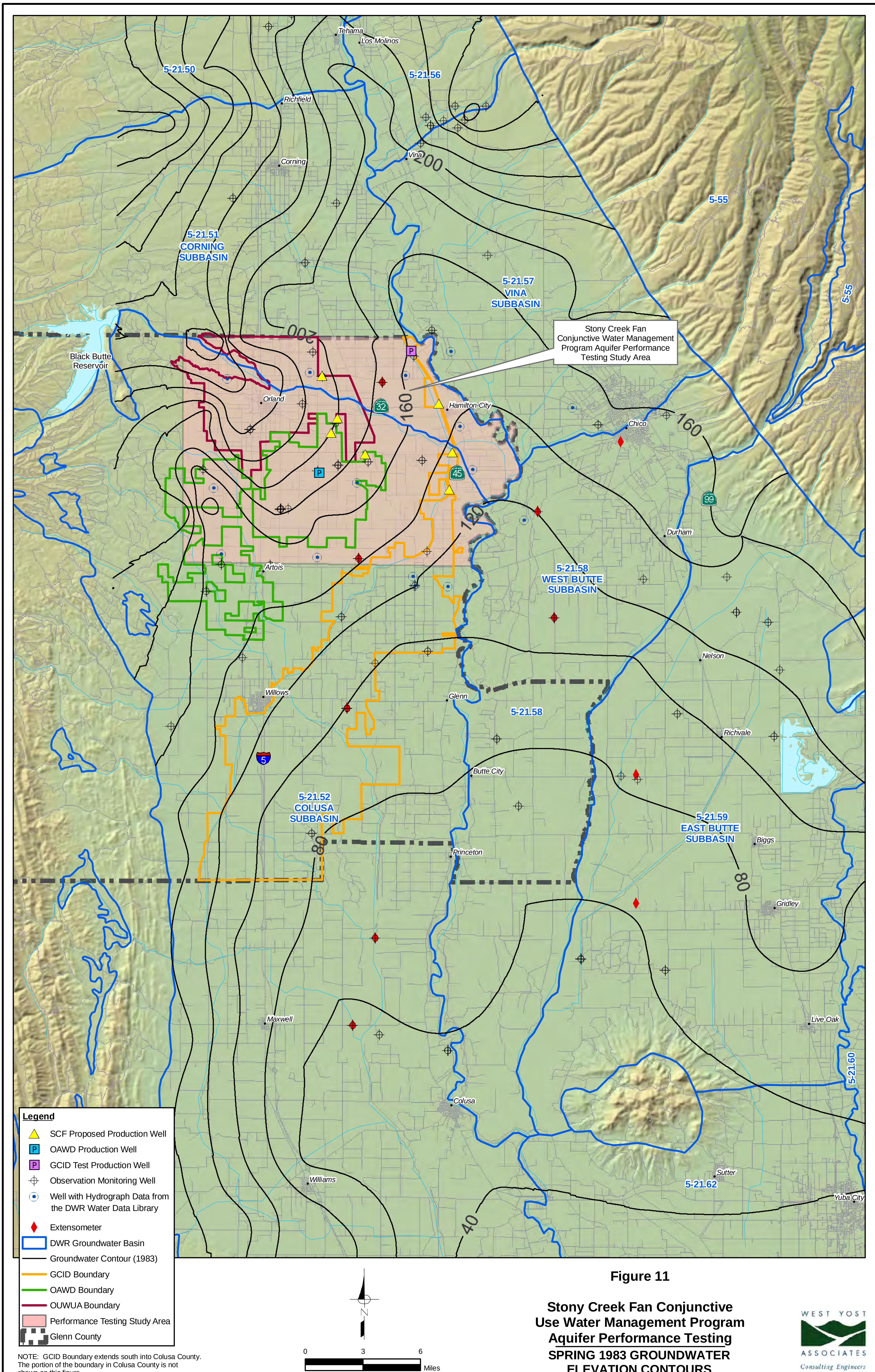
NOTE: GCID Boundary extends south into Colusa County. The portion of the boundary in Colusa County is not shown on this figure.

Figure 10

Stony Creek Fan Conjunctive Use Water Management Program Aquifer Performance Testing

SPRING 1977 GROUNDWATER ELEVATION CONTOURS

WEST YOST ASSOCIATES
Consulting Engineers



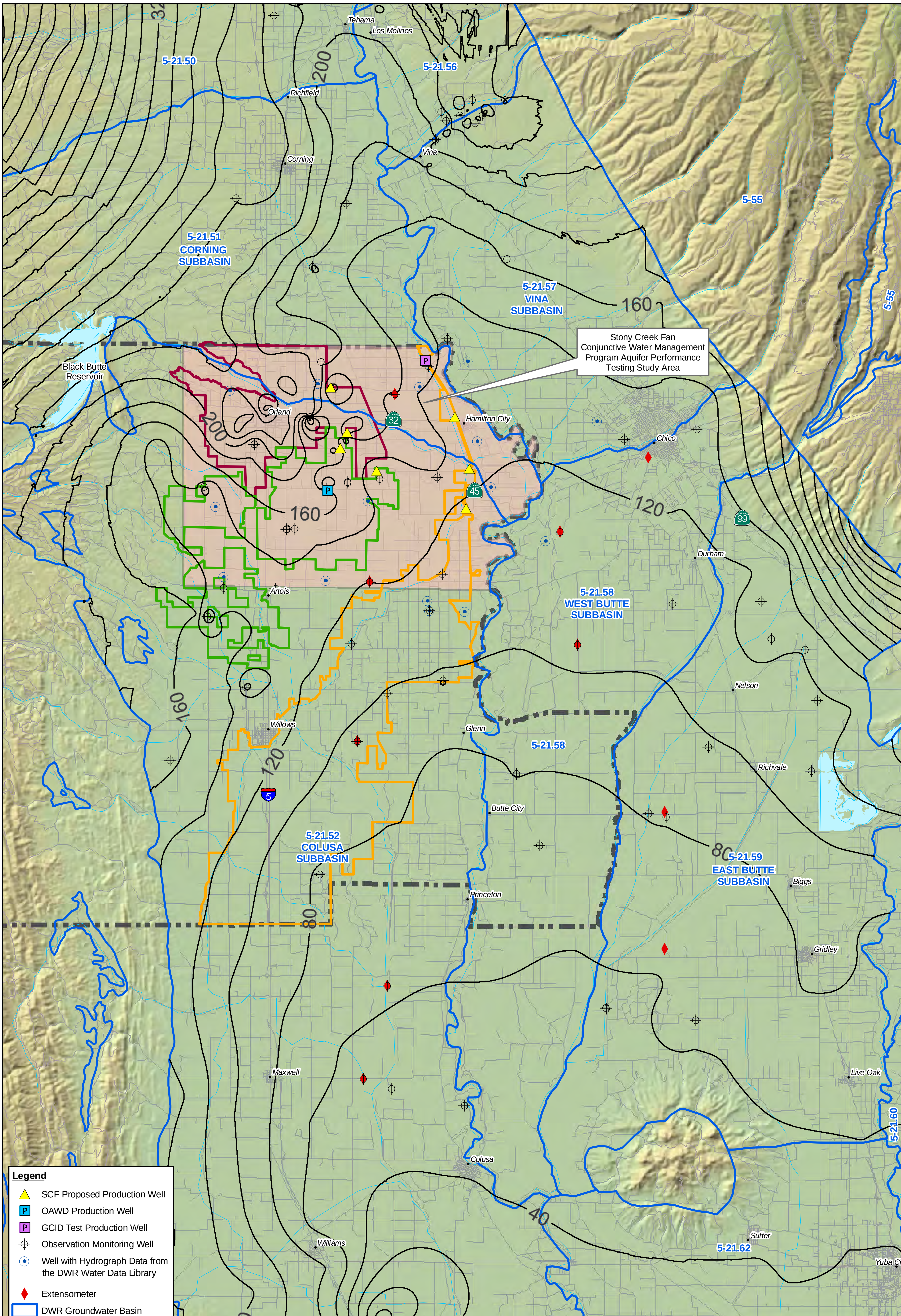
NOTE: GCID Boundary extends south into Colusa County. The portion of the boundary in Colusa County is not shown on this figure.

Figure 11

Stony Creek Fan Conjunctive Use Water Management Program Aquifer Performance Testing

SPRING 1983 GROUNDWATER ELEVATION CONTOURS

WEST YOST ASSOCIATES
Consulting Engineers



NOTE: GCID Boundary extends south into Colusa County. The portion of the boundary in Colusa County is not shown on this figure.

N

0 3 6 Miles

Figure 12

Stony Creek Fan Conjunctive Use Water Management Program Aquifer Performance Testing

SPRING 2008 GROUNDWATER ELEVATION CONTOURS

WEST YOST ASSOCIATES Consulting Engineers

The hydrographs in Appendix C indicate groundwater elevations in individual wells fluctuate to varying degrees depending on well location, season and annual hydrologic conditions. In general groundwater elevations in the study area have been relatively stable (DWR, 2006).

The data available at the DWR water data library provide an adequate basis for establishing historical baseline groundwater elevations conditions for the SCF APT. The monitoring well network shown on Figures 4 and 13 would provide adequate monitoring of the groundwater levels during implementation of the SCF APT.

Previous Multi-Day Aquifer Performance Testing

The DWR, Northern District performed constant-discharge aquifer test in 2007 to better understand the local hydrogeologic characteristics of the SCF APT study area (Figure 14). GCID drilled and constructed a test-production well in 2005 and a quadruple completion observation well in 2006, near their main pump station on County Road 203 in Glenn County. A pump test was conducted in December 2005 to finalize the pump design and to estimate preliminary aquifer parameters. A constant-discharge aquifer test was conducted in April and May 2007 to determine the hydrogeologic characteristics of the aquifer and to monitor potential groundwater level impacts. DWR, Northern District personnel provided oversight and technical support during the drilling and construction process and throughout testing.

Evaluation of the lithologic cuttings and geophysical logs in the test-production well, and nearby observation wells, indicate that the underlying geologic sediments which comprise the aquifer systems are derived from the Stony Creek Fan alluvium, the Tuscan Formation, the Tehama Formation, and the Upper Princeton Valley fill. The local aquifer system is complex and multiple aquifer zones have been identified; in places, the aquifer zones are associated with distinct formations, and in other places they are associated with intermixed formation deposits. The test-production well is screened primarily across intermixed zones of the Tehama and Tuscan Formation sediments, with the bottom portion of the well screened across Tuscan sediments only.

Transmissivity values estimated from time-drawdown and distance-drawdown data associated with the 28-day constant-discharge aquifer test range from 29,806 to 36,960 gpd/ft. Aquifers with transmissivity values in this range are generally considered good, capable of yielding sufficient quantities of water for irrigation purposes. Hydraulic conductivity values ranged from 75 to 86 gpd/ft^2, which are typical values for silty-sand and clean-sand. Storativity values range from 1.2×10^{-6} to 7.6×10^{-6}.

Groundwater drawdown in the test-production well recovered to about 91 percent of the starting elevation within 15-days of turning off the well, and continued a slow recovery to a maximum of 93 percent at day 41. The highest point of recovery remained about 13 feet below the starting groundwater level. The majority of the unfulfilled recovery is likely attributed to the steady regional decline of groundwater levels in the lower aquifer during the test period.

Test-production well operations and testing indicates that at a flow rate of 3,500 gpm, the well had a specific capacity of 17.9 gpm/ft-dd. The volume of water pumped over the 28-day test period was 429 acre-feet.

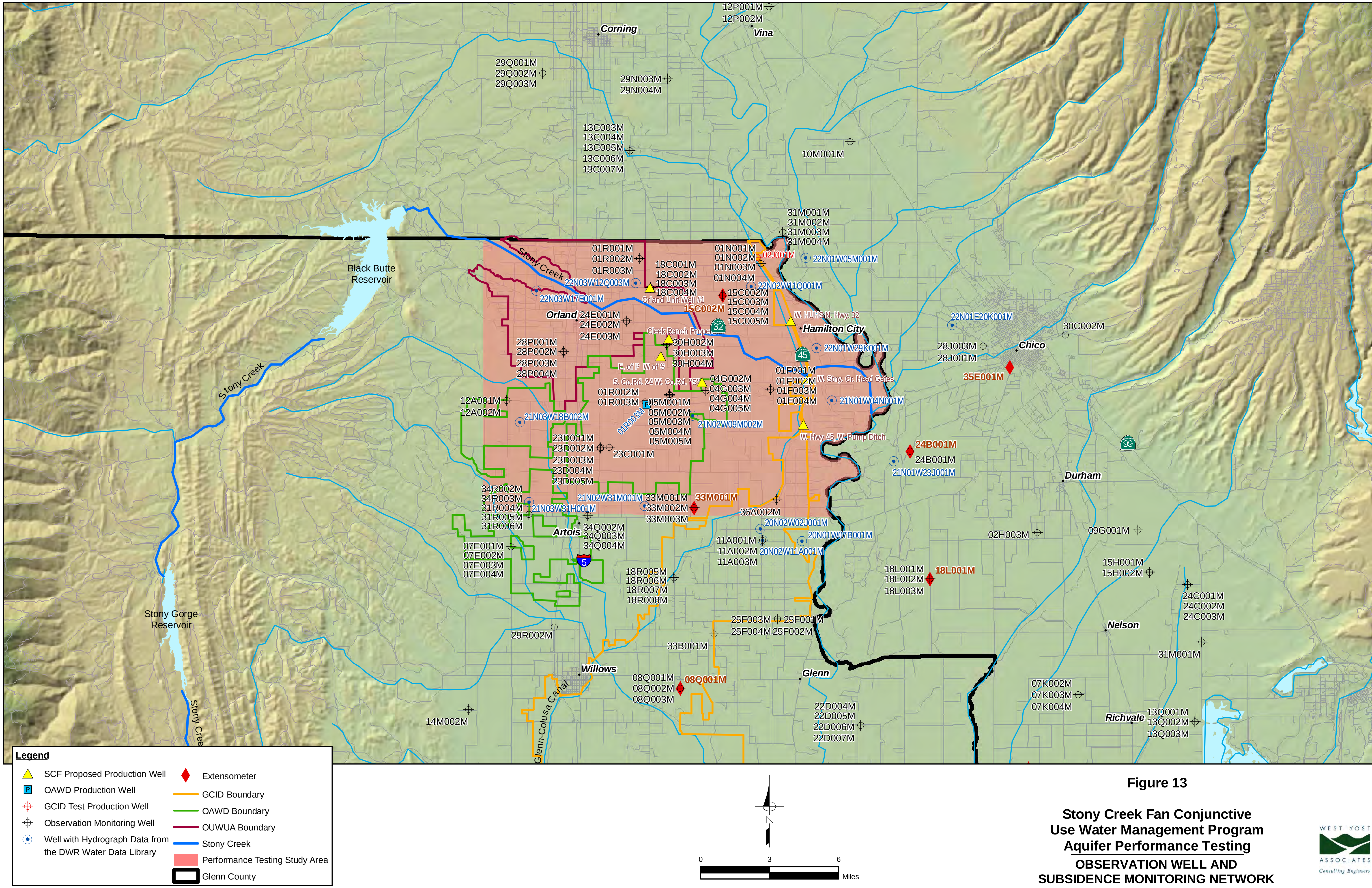


Figure 13

Stony Creek Fan Conjunctive Use Water Management Program Aquifer Performance Testing

OBSERVATION WELL AND SUBSIDENCE MONITORING NETWORK

WEST YOST ASSOCIATES
Consulting Engineers

Groundwater level data from the monitoring wells during the 28-day aquifer test indicated that wells screened in the same aquifer zone showed test-related drawdown of about 70 feet at 0.3 miles, 20 feet at 2.2 miles, and 0 feet at 4.8 miles. Distance-drawdown analysis indicates a 28-day radius of influence (point of zero drawdown) at about 5 miles.

The nearby observation well, 22N02W01N002M, with a screened interval about 100-feet above the test-production well, showed a potential test-related drawdown of as much as 25 feet, at a distance of 0.3 miles.

None of the remaining forty-three monitoring wells showed any sign of drawdown related to the test-production well pumping. However, many of the monitoring wells screened within the middle aquifer zone showed a steady decline in groundwater levels, along with periodic fluctuations, during the 28-day test period. The periodic fluctuation in groundwater levels are interpreted to be in response to other nearby irrigation wells which also operate within the middle portion of the aquifer. The steady decline in groundwater levels is considered to be largely attributed to the normal seasonal fluctuations within the middle aquifer in this area. The 2007 spring to summer change in groundwater levels for the middle portion of the aquifer in this area showed declines of 20 to 30 feet.

3.2.1.3 Groundwater Quality

Calcium-magnesium bicarbonate and magnesium-calcium bicarbonate are the predominant groundwater types in the study area, but calcium bicarbonate waters are encountered locally from Orland to Artois and near Stony Creek (DWR, 2006). Because the majority of wells in the area are less than 400 feet deep, the water quality indicated in (DWR, 2006) is probably not representative of the depths greater than 700 feet, which are the focus of the SCF APT.

Water quality samples were collected from the GCID test-production well (22N02W02J001M) and the nearby nested set of quadruple-completion observation wells (22N02W01N001M through 22N02W01N004M). Figure 14 shows the locations of the wells. Water quality samples were collected by DWR and analyzed by Bryte and Zymex Laboratories - State certified water quality laboratories. Parameter analysis consisted of physical parameters such as temperature, electrical conductivity and pH, as well as minor elements, nutrients, minerals, and stable oxygen isotopes. Water quality sampling in the test-production well was conducted after well construction and development in December 2005, and at the beginning and end of the constant-discharge aquifer test, in April and May, 2007. Water quality samples were also collected from each of the nested observation wells in August 2006 and at the end of the constant-discharge aquifer test in May, 2007.

Analytical results are provided in the Tables 1 through 3. Overall, the water quality results indicate that the groundwater samples from all wells are of generally excellent quality. Water quality character in the wells varies from calcium-magnesium bicarbonate in the shallower zones, to sodium bicarbonate in the deeper zones. Conductivity is slightly higher in the shallower zones, while pH is typically lower. The pH values in the shallower zones range from 7.3 to 7.6, while the deeper zones range from 8.2 up to 8.5.

The general mineral physical and isotopic data indicate that groundwater quality did not change over the course of the 28-day aquifer test, and there were no indication of adverse impacts to water quality, including potential impacts due to movement of deeper brackish or saline water into the deep freshwater aquifer zone.

Table 1. Groundwater Quality – Minerals and Physicals

GCID AQUIFER PERFORMANCE TEST															
WATER QUALITY - MINERALS and PHYSICALS															
State Well Number	Date	Time (PST)	Temp. °C	Temp. °F	pH (Field) (Units)	Field Conductivity (µmhos/cm)	Lab Conductivity (µmhos/cm)	Turbidity (Field) (NTU)	Dissolved Potassium (mg/L)	Dissolved Sodium (mg/L)	Total Calcium (mg/L)	Dissolved Calcium (mg/L)	Total Magnesium (mg/L)	Dissolved Magnesium (mg/L)	Alkalinity (mg/L as CaCO3)
22N02W02J001M	12/14/05	1200	23.4	74.12	8.4	466	459	0.2	4.4	89	9.0	9	4	4	166
22N02W02J001M	04/18/07	1145	22.8	73.04	8.3	408	406	0.11	1.9	74	11	11	5	5	153
22N02W02J001M	05/16/07	0750	24.2	75.56	8.2	476	475	0.17	3.6	91	9	9	4	4	161
22N02W01N001M	08/31/06	1145	22.6	72.68	8.5	324	328	0.2	1.6	59	12	12	6	6	158
22N02W01N001M	05/16/07	0900	24.1	75.38	8.2	344	340	0.44	1.8	60	12	12	6	6	158
22N02W01N002M	08/31/06	1055	21.7	71.06	8.2	314	326	0.12	1.8	55	13	13	5	5	151
22N02W01N002M	05/16/07	1020	22.1	71.78	8.2	331	330	0.44	1.8	56	12	12	5	5	152
22N02W01N003M	08/31/06	1235	21.15	70.07	7.6	526	543	0.3	0.8	28	50	49	24	24	190
22N02W01N003M	05/16/07	1115	21.0	69.80	7.6	557	556	1.15	0.8	30	48	50	24	25	192
22N02W01N004M	08/31/06	1405	20.0	68.00	7.5	346	359	1.1	0.5	15	32	31	18	18	145
22N02W01N004M	05/16/07	1215	20.6	69.08	7.3	499	503	1.10	0.6	20	46	45	28	27	178
CDPH* Primary Maximum Contaminant Level								1/5 NTU****							
CDPH Secondary Maximum Contaminant Level						900 µmhos/cm		5 NTU****							
USEPA** Primary Maximum Contaminant Level								1/5 NTU****							
USEPA** Secondary Maximum Contaminant Level					<6.5 or >8.5										
CDPH California State Notification Level															
Agricultural Water Quality Limits***					<6.5 or >8.5	700 µmhos/cm				69 mg/L					
1/5 NTU**** 1-After Water Treatment; 5-No Water															

*California Department of Public Health (Formerly California Department of Health Services)
** United States Environmental Protection Agency
***From Water Quality for Agriculture by the Food and Agriculture Organization of the United Nations

Blank boxes reflect no Primary or Secondary Maximum Contaminant Levels, Notification Levels, or Agricultural Limits have been established for that parameter

Units
mg/L (milligrams per liter) = ppm (parts per million)
µg/L (micrograms per liter) = ppb (parts per billion)
ng/L (nanograms per liter) = ppt (parts per trillion)
pH = units
µmhos/cm = micromhos/cm
NTU = Nephelometer Turbidity Units

Table 1. Groundwater Quality – Minerals and Physicals, cont'd…

GCID AQUIFER PERFORMANCE TEST WATER QUALITY - MINERALS and PHYSICALS (continued)														
State Well Number	Date	Time (PST)	SAR	ASAR	Dissolved Sulfate (mg/L)	Dissolved Chloride (mg/L)	Dissolved Nitrate (mg/L)	Total Dissolved Solids (at 180 °F)	Dissolved Hardness (mg/L as CaCO3)	Total Hardness (mg/L as CaCO3)	Dissolved Boron (mg/L)	Dissolved Carbonate (mg/L)	Dissolved Bicarbonate (mg/L)	Dissolved Hydroxide (mg/L)
22N02W02J001M	12/14/05	1200	6.2	8.1	4	53	<0.1	293	39	39	0.2	10	156	<1
22N02W02J001M	04/18/07	1145	4.6	6.3	12	29	<0.1	254	48	48	<0.1	3	133	<1
22N02W02J001M	05/16/07	0750	6.3	8.2	6	51	<0.1	301	39	39	0.1	5	156	<1
22N02W01N001M	08/31/06	1145	3.5	5.0	12	7	<0.1	206	55	55	<0.1	3	155	<1
22N02W01N001M	05/16/07	0900	3.5	5.1	12	7	<0.1	194	55	55	<0.1	3	155	<1
22N02W01N002M	08/31/06	1055	3.3	4.6	12	7	<0.1	210	53	53	<0.1	2	149	<1
22N02W01N002M	05/16/07	1020	3.4	4.8	13	8	<0.1	202	51	51	<0.1	3	149	<1
22N02W01N003M	08/31/06	1235	0.8	1.7	26	34	23.0	311	221	224	0.1	1	189	<1
22N02W01N003M	05/16/07	1115	0.9	1.8	28	35	8.3	313	228	219	<0.1	2	191	<1
22N02W01N004M	08/31/06	1405	0.5	1.0	14	14	7.1	205	152	154	<0.1	<1	145	<1
22N02W01N004M	05/16/07	1215	0.6	1.2	24	32	16.5	280	224	230	<0.1	1	177	<1
CDPH* Primary Maximum Contaminant Level														
CDPH Secondary Maximum Contaminant Level					250 mg/L	250 mg/L		500 mg/L						
USEPA** Primary Maximum Contaminant Level					500 mg/L									
USEPA** Secondary Maximum Contaminant Level					250 mg/L	250 mg/L		500 mg/L						
CDPH California State Notification Level											1,000 µg/L			
Agricultural Water Quality Limits***														
1/5 NTU**** 1-After Water Treatment; 5-No Water						106 mg/L		450 mg/L			700 mg/L			

*California Department of Public Health (Formerly California Department of Health Services)
** United States Environmental Protection Agency
***From Water Quality for Agriculture by the Food and Agriculture Organization of the United Nations

Blank boxes reflect no Primary or Secondary Maximum Contaminant Levels, Notification Levels, or Agricultural Limits have been established for that parameter

Units
mg/L (milligrams per liter) = ppm (parts per million)
µg/L (micrograms per liter) = ppb (parts per billion)
ng/L (nanograms per liter) = ppt (parts per trillion)
pH = units
µmhos/cm = micromhos/cm
NTU = Nephelometer Turbidity Units

Table 2. Groundwater Quality – Minor Elements

GCID AQUIFER PERFORMANCE TEST
WATER QUALITY - MINOR ELEMENTS

State Well Number	Date	Time (PST)	Total Aluminum (µg/L)	Dissolved Aluminum (µg/L)	Total Arsenic (µg/L)	Dissolved Arsenic (µg/L)	Total Cadmium (µg/L)	Dissolved Cadmium (µg/L)	Total Chromium (µg/L)	Dissolved Chromium (µg/L)	Total Copper (µg/L)	Dissolved Copper (µg/L)	Total Iron (µg/L)	Dissolved Iron (µg/L)
22N02W02J001M	12/14/05	1200	6.93	6	8	7.91	<0.005	<0.005	1.96	1.95	0.868	0.67	17.3	13.1
22N02W02J001M	04/18/07	1145	6.94	5.22	8.63	8.32	<0.1	<0.1	0.07	<0.05	0.5	0.45	22	8.5
22N02W02J001M	05/16/07	0750	6.74	5.56	8.56	8.5	<0.1	<0.1	0.1	0.1	<0.05	<0.05	5.5	5
22N02W01N001M	08/31/06	1145	76.9	30	6.73	6	<0.1	<0.1	0.39	0.3	0.07	0.06	34	5.4
22N02W01N001M	05/16/07	0900	13.5	7.43	6.62	6.28	<0.1	<0.1	1.62	1.44	0.15	0.1	16.2	6
22N02W01N002M	08/31/06	1055	9.27	7.7	5.89	5.22	<0.1	<0.1	0.18	0.16	0.35	0.25	4.9	3.3
22N02W01N002M	05/16/07	1020	9.04	5.96	5.54	5.32	<0.1	<0.1	0.44	0.3	0.3	0.16	8.7	2.5
22N02W01N003M	08/31/06	1235	11.3	4.76	1.81	1.74	<0.1	<0.1	4.08	3.13	0.19	0.19	6.3	1.6
22N02W01N003M	05/16/07	1115	11.4	7.21	2.13	2.07	<0.1	<0.1	3.53	3.25	0.26	0.22	10	6.7
22N02W01N004M	08/31/06	1405	39.7	15.6	0.838	0.815	<0.1	<0.1	1.29	1.2	0.23	0.19	43.1	11.7
22N02W01N004M	05/16/07	1215	25.1	4.69	0.588	0.487	<0.1	<0.1	2.05	1.52	0.3	0.26	35	0.5
CDPH* Primary Maximum Contaminant Level			1,000 µg/L		50 µg/L		5 µg/L		50 µg/L		1,300 µg/L			
CDPH Secondary Maximum Contaminant Level			200 µg/L								1,000 µg/L		300 µg/L	
USEPA** Primary Maximum Contaminant Level					10 µg/L		5 µg/L		100 µg/L		1,300 µg/L			
USEPA** Secondary Maximum Contaminant Level			50-200 µg/L								1,000 µg/L		300 µg/L	
CDPH California State Notification Level														
Agricultural Water Quality Limits***			5,000 µg/L		100 µg/L		10 µg/L				200 µg/L		5,000 µg/L	

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<u>Units</u>
mg/L (milligrams per liter) = ppm (parts per million)
µg/L (micrograms per liter) = ppb (parts per billion)
ng/L (nanograms per liter) = ppt (parts per trillion)

Reference: DWR, Northern District (in progress)

Table 2. Groundwater Quality – Minor Elements, cont'd…

GCID AQUIFER PERFORMANCE TEST WATER QUALITY - MINOR ELEMENTS (continued)															
State Well Number	Date	Time (PST)	Total Lead (µg/L)	Dissolved Lead (µg/L)	Total Manganese (µg/L)	Dissolved Manganese (µg/L)	Mercury (ng/L)	Total Nickel (µg/L)	Dissolved Nickel (µg/L)	Total Selenium (µg/L)	Dissolved Selenium (µg/L)	Total Silver (µg/L)	Dissolved Silver (µg/L)	Total Zinc (µg/L)	Dissolved Zinc (µg/L)
22N02W02J001M	12/14/05	1200	0.159	0.142	20.8	20.2	0.22	0.317	0.25	0.912	0.91	<0.001	<0.001	0.893	0.82
22N02W02J001M	04/18/07	1145	<0.04	<0.04	36.3	36	0.3	0.12	<0.1	0.31	0.22	<0.03	<0.03	2.83	1.24
22N02W02J001M	05/16/07	0750	<0.04	<0.04	22.6	21.6	0.38	0.18	0.12	0.28	0.25	<0.03	<0.03	2.54	0.22
22N02W01N001M	08/31/06	1145	<0.04	<0.04	26.7	25.2	0.54	0.46	0.44	<0.2	<0.2	<0.03	<0.03	0.43	0.21
22N02W01N001M	05/16/07	0900	<0.04	<0.04	27	23.3	0.62	0.91	0.78	<0.2	<0.2	<0.03	<0.03	1.79	0.3
22N02W01N002M	08/31/06	1055	<0.04	<0.04	35.6	34.6	0.78	0.55	0.5	<0.2	<0.2	<0.03	<0.03	0.35	0.24
22N02W01N002M	05/16/07	1020	<0.04	<0.04	22.3	21.3	0.92	0.51	0.4	<0.2	<0.2	<0.03	<0.03	1.5	0.21
22N02W01N003M	08/31/06	1235	<0.04	<0.04	2.19	0.93	0.37	0.65	0.57	0.66	0.6	<0.03	<0.03	0.57	0.45
22N02W01N003M	05/16/07	1115	<0.04	<0.04	0.65	0.45	0.39	0.65	0.63	0.58	0.52	<0.03	<0.03	1.63	0.29
22N02W01N004M	08/31/06	1405	<0.04	<0.04	2.38	0.65	0.53	1.3	1.2	0.41	0.38	<0.03	<0.03	0.46	0.33
22N02W01N004M	05/16/07	1215	<0.04	<0.04	1.61	0.76	0.33	0.77	0.63	0.28	0.21	<0.03	<0.03	2.02	0.73
CDPH* Primary Maximum Contaminant Level			15 µg/L				2,000 ng/L	100 µg/L		50 µg/L					
CDPH Secondary Maximum Contaminant Level					50 µg/L							100 µg/L		5,000 µg/L	
USEPA** Primary Maximum Contaminant Level			15 µg/L				2,000 ng/L			50 µg/L					
USEPA** Secondary Maximum Contaminant Level					50 µg/L							100 µg/L		5,000 µg/L	
CDPH California State Notification Level					500 µg/L (Notification Level)										
Agricultural Water Quality Limits***			5,000 µg/L		200 µg/L			200 µg/L		20 µg/L				2,000 µg/L	

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ng/L (nanograms per liter) = ppt (parts per trillion)

Table 3. Groundwater Quality – Oxygen and Hydrogen Isotopes

GCID AQUIFER PERFORMANCE TEST WATER QUALITY - ISOTOPES				
State Well Number	Sample Date	Time (PST)	δ18O 0/00	δD 0/00
22N02W02J001M	04/18/07	1145	-12.3	-85.4
22N02W02J001M	05/16/07	0750	-12.1	-87.5
22N02W01N001M	08/31/06	1145	-12.1	-85.2
22N02W01N001M	05/16/07	0900	-12.3	-85.6
22N02W01N002M	08/31/06	1055	-12.1	-85.4
22N02W01N002M	05/16/07	1020	-12.3	-84.5
22N02W01N003M	08/31/06	1235	-10.5	-71.0
22N02W01N003M	05/16/07	1115	-10.8	-72.3
22N02W01N004M	08/31/06	1405	-11.6	-80.2
22N02W01N004M	05/16/07	1215	-11.5	-78.9

Reference: DWR, Northern District (in progress)

3.2.1.4 Inelastic Land Subsidence

Land subsidence due to groundwater withdrawal is triggered by decreases in pore pressure in a confined aquifer system containing clay layers (typically, montmorillonite clay). The decrease in pore pressure increases the effective stress on the aquifer skeleton. If this effective stress exceeds the maximum stress to which the aquifer skeleton has been subjected in the past, the clay layers would undergo permanent compaction.

The DWR, in collaboration with county agencies and local water districts, has established land subsidence monitoring in the Sacramento Valley as part of overall efforts to understand and manage the groundwater resources. There are six extensometer stations that have been constructed in the vicinity of the SCF APT (Figure 13). The extensometer locations are also collocated with multi-completion groundwater level monitoring wells (UCCE, 2006). The extensometer network provides continuous monitoring of ground displacement. These records can be accessed at the DWR Northern District website at http://www.nd.water.ca.gov/Data/Extensometers/Data/index.cfm. The available extensometer records indicate that elastic subsidence on the order of several hundredths of a foot occurs in the region. Elastic subsidence occurs in response to seasonal changes in pore pressure within the aquifer system. Elastic subsidence is a characteristic of any confined aquifer system and does not result in permanent compaction.

The extensometer network and data available at the DWR Northern District website provides an adequate basis for establishing historical baseline subsidence conditions for the SCF APT. The extensometer network would also provide adequate monitoring of the potential for inelastic land subsidence during implementation of the SCF APT.

3.2.1.5 Glenn-Colusa Irrigation District

Because of GCID's large and relatively reliable surface water supplies, groundwater is not extensively developed or used within the District. However, there are about 200 private groundwater wells within the District, which are used by individual farmers to augment GCID surface water supplies in dry years, and in situations were farmers prefer to use groundwater rather than surface water. Most private wells draw primarily from the Tehama Formation, although the typical well drilling practice is to perforate wells at all levels where water bearing strata are found. Thus, private wells may draw from aquifers above the Tehama Formation and from deeper aquifers depending on well depth. Average annual private pumping in the northern portion of GCID (the portion in Glenn County) is estimated to be 11,000 acre-feet for the period 1970 through 2000 (Davids Engineering, 2006).

In selected years, GCID uses a voluntary, incentive based program to encourage private well owners to produce groundwater to supplement District surface water supplies. This involves paying well owners on a volumetric basis to operate their wells and to forego using an equal volume of District water, thereby expanding the total available water supply. The maximum seasonal production from this program was 67,000 acre-feet in 1992, which was used to meet local needs within GCID, and also to decrease the amount of surface water diverted which was transferred to meet statewide water needs.

GCID has constructed two District-owned groundwater test-production wells in recent years, one completed in 1985 and the other in 2005. Both wells are located in the general vicinity of the proposed test wells and are part of the District's ongoing efforts to better define groundwater conditions within the District, with particular emphasis on the lower aquifer system. DWR Northern District assisted GCID with the design, construction, and testing of the 2005 well for the purpose of collecting data that would help define the characteristics of the lower aquifer systems and groundwater conditions in the vicinity of the well. This included conducting a 28-day constant-discharge test in spring 2007 during which time water levels were observed and recorded in neighboring monitoring wells. One of the observation wells is a quadruple completion well located about ¼-mile from the test-production well, constructed at about the same time as the test-production well.

3.2.1.6 Orland Artois Water District

Although it is not known how many private groundwater production wells exist in OAWD, water supply-demand analyses indicate that substantial quantities of groundwater are produced by private pumpers each year to augment the District's available surface water supplies to meet irrigation demands. Between 1984 (when the District distribution system was completed and CVP surface water deliveries reached full scale) and 2000, average private pumping was estimated to be 21,000 acre-feet annually, or about 0.8 acre-feet per acre. Based on general information about private well depths, the large majority of private pumping is believed to be from the Tehama Formation.

The District completed construction of one lower aquifer test-production well in 2005 and has operated the well for water supply and testing purposes each irrigation season since then. The well is 1,320 feet deep with solid casing to a depth of 590 feet and with multiple screened intervals below that depth. It is equipped with a 200 horsepower electric motor. Water level in the well is between 70 and 80 feet below ground surface (bgs) during the non-irrigation season and draws down within days of the start of pumping to between 200 and 220 feet bgs. Initial well production is about 3,000 gpm and declines as drawdown increases, stabilizing at between 1,800 and 2,000 gpm. Thus far, well operation has had no discernable effects on performance of neighboring private wells.

3.2.1.7 Orland Unit Water Users Association

The Orland Project has a highly reliable surface water supply. Consequently, groundwater is not extensively used or developed within the Project. Pumping from private groundwater wells is estimated to have averaged just 3,000 acre-feet during the period 1970 through 2000 (Davids Engineering, 2007), or about 0.15 acre-feet per acre. Although OUWUA typically has a reliable and adequate water supply to deliver to its farmers, its 100-year old distribution system can only accommodate rotational irrigation deliveries that do not provide necessary flexibility to support modern irrigation techniques required for most perennial crops. Consequently, there is an increasing trend of Orland Project lands being planted to orchards and irrigated by drip and sprinkler systems supplied by groundwater wells.

3.2.2 Environmental Consequences

3.2.2.1 No Action

Under the no action alternative, groundwater development and use would continue as it presently does within the respective service areas of the SCF Partners.

3.2.2.2 Proposed Action

Under the proposed action, groundwater would be produced from the lower aquifer system to facilitate the aquifer tests, as previously described in Section 2.2.2.2. The lower aquifer system includes water bearing strata in the Lower Tuscan formation and lower portions of the Tehama formation. All groundwater produced by the test-production wells would be discharged into the three SCF Partners' respective surface water distribution systems and integrated with surface water operations. Some of the relatively minor amounts of water produced in test Phases 1 and 2 may be discharged into canal or drainage systems, or directly to fallowed fields and allowed to percolate back into the groundwater system. All of the groundwater produced in test Phase 3 would be used for irrigation.

The estimated volumes of groundwater that would be produced per test-production well during the three test phases are tabulated below. This is followed by discussion of the effects of the proposed test pumping on the SCF Partner's surface water and groundwater resources.

Table 4. Estimated Groundwater Pumping Durations, Rates and Volumes by Test Phase per Test-Production Well

Test Phase	Approximate Pumping Duration (days)	Assumed Average Pumping Rate (gallons per minute)	Estimated Groundwater Volume (af)/well	Total Groundwater Volume (af) - based on 7 wells
1 – Constant Rate Test	1	2,300	10	70
2 – Multi-day Test	30 days	4,000	540	3,780
3 – Operational Test	180 days	4,000	3,240	22,680
		Total =	3,790	26,530

In GCID, all groundwater produced during aquifer testing would be discharged into GCID's main canal, commingled with surface supplies and delivered to users for irrigation, rice straw decomposition, or maintenance of waterfowl habitat. For the three test-production wells scheduled for construction within GCID, the total volume of test pumping would be 11,370 acre-feet, including 30 acre-feet in test Phase 1, 1,620 acre-feet in test Phase 2 and 9,720 acre-feet in test Phase 3.

In OAWD, the approximately 1,100 acre-feet of groundwater produced by the two test-production wells during aquifer test Phases 1 and 2 would be discharged to open drains or delivered to district lands located near the test-production well sites. Following test Phase 2, the test-production wells would be connected to the District's pipeline distribution system, making it possible to deliver the groundwater to District water users. The approximately 6,480 acre-feet of groundwater produced during test Phase 3 would be used to augment available surface water supplies during the irrigation season. This would have the effect of reducing private groundwater pumping by an equivalent amount.

In OUWUA, the approximately 1,110 acre-feet of groundwater produced by the two test-production wells during aquifer test Phases 1 and 2 would be discharged into the surface water distribution system and either delivered to Orland Unit lands or discharged to local drains. The approximately 6,480 acre-feet of groundwater produced during test Phase 3 would be used to augment available surface water supplies during the irrigation season.

In GCID and OUWUA, the aggregate Phase 3 pumping would be 18,500 acre-feet per season. In OAWD, test pumping from the lower aquifer system would enlarge the District's water supply, resulting in a reduction of pumping from private wells in the overlying Tehama Formation and other shallower aquifers. As noted previously, the total volume of test pumping from the two test-production wells is estimated to be 6,480 acre-feet over each single-season test period. Although the intent of the operational testing (Phase 3) is to produce measurable effects, the magnitude and duration of these effects would not be sufficient to cause adverse impacts or result in a serious or major disturbance to groundwater resources. If monitoring indicates a significant decline in groundwater levels in the relevant vicinity of the test pumps, and that any such decline is not directly attributable to a cause other than the proposed action, then the test pumping would be modified or terminated as necessary to avoid any significant adverse impacts.

Increased use of groundwater in Glenn County by the SCF Partners under conjunctive use scenarios could potentially affect groundwater levels, water quality, surface water/groundwater interactions, and rates of inelastic land subsidence. These potential impacts could extend beyond the SCF Partners' service areas. The Glenn County Groundwater Management Plan provides the management and institutional framework for assessing and managing these potential impacts, and is incorporated in this plan by reference. Furthermore, monitoring and mitigation is included as part of the proposed action. The monitoring and mitigation would ensure no significant impacts would occur as a result of the proposed action.

DWR Northern District performed a multi-day constant discharge aquifer test in the existing test-production well 22N02W02J001M during spring 2007. The test-production well was pumped at a near-constant rate of approximately 3,500 gpm for 28 days (approx. 433 acre-feet). Preliminary results from the test indicate that drawdown effects were evident in wells monitoring the deeper aquifer systems (approximately 700 feet to 1,000 feet below ground surface) at a distance of two miles, but were not evident in the next closest deep aquifer monitoring well at a distance of five miles. Thus, the deep aquifer radius of influence associated with the 2007 deep aquifer testing is estimated to be between three to five miles. Shallow aquifers in the vicinity of the deep aquifer pumping well showed no apparent response to the deep aquifer pumping. The closest multi-completion monitoring well, at a distance of about 0.3 miles, showed no evidence of groundwater level decline in aquifer zones screened above approximately 700 feet. Based on this information, it appears that any effects due to the Phase 2 testing would mostly be restricted to the depths greater than approximately 700 feet and a radius of approximately three to five miles or less. A copy of the test report is available from DWR Northern District.

The aquifer performance test of the existing GCID test-production well did not affect shallow groundwater levels and therefore could not have measurably affected stream flow, riparian habitats or wetland habitats. By extension, the planned Phase 2 testing would not have an adverse effect on any of these features.

DWR monitors groundwater levels in over 100 single and multi-completion observation wells throughout the northern Sacramento Valley on a quarterly basis, as well as in over 300 irrigation and domestic wells semi-annually (Figure 4). Continuous groundwater level data loggers are installed in the majority of observation wells monitoring the various aquifer zones that are pumped in the northern Sacramento Valley.

These existing observation wells would be used to monitor pumping effects induced by the test-production wells whenever possible. Several of the test-production well locations are within a three- to four-mile radius of existing DWR observation wells.

Because the majority of observation wells have been installed in the last ten years, groundwater levels measured by domestic and irrigation wells over longer time periods would also be used to evaluate seasonal and multiyear groundwater level fluctuations. These data are maintained by DWR and are available to the public via internet access through the DWR Water Data Library (http://wdl.water.ca.gov/gw/).

DWR has eight extensometers in the Sacramento Valley that measure land subsidence. Additionally, Butte, Colusa, Glenn and Tehama counties have established a Global Positioning System land subsidence network. The subsidence data would be reviewed to identify any changes that occur during the test pumping, and to determine if there is any causal connection.

3.2.2.3 Cumulative Effects

Groundwater supply data collected as part of DWR Bulletin 160-05 indicates that approximately 1,200,000 acre-feet of groundwater is extracted from the Sacramento Valley portion of Butte, Colusa, Glenn and Tehama Counties during a normal water year[6]. Operational testing associated with this pilot-scale program is only estimated to pump a maximum volume of 26,530 acre-feet[7] per (Table 1) irrigation season for two years, or approximately two percent of the regional average annual groundwater extraction. Analysis also indicates that some of this pumped groundwater would recharge the aquifer system due to infiltration along conveyance systems and deep percolation associated with applied

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[6] Groundwater supply estimates based on data developed by Department of Water Resources Northern District for the DWR Bulletin 160-05 Water Plan. Estimates were calculated based on actual water year 2000 (normal water year) for the area consisting of Butte, Colusa, Glenn and Tehama Counties. Based on water balance analyses conducted in relation to the SCF Feasibility Investigation for the 1970 through 2000 period (Technical Memorandum No. 3, Davids Engineering, 2006).

[7] Volume of pumping is based on 7 wells each producing 4,000 gallons per minute, which is equivalent to 18 acre-feet per day. The duration of testing would be 30 days per month for 7 months (April – October).

groundwater. Based on water balance analysis, an estimated 9,000 acre-feet of water may be recharged to the aquifer system.

Phases 1 and 2 of the SCF APT would be conducted on a well-by-well basis prior to the periods in the irrigation season when groundwater demands are greatest. The amount of water to be pumped is AF, and would occur for 1 day during Phase 1 and 28 days for Phase 2. The likelihood of groundwater pumping to result in long-term cumulative impacts based on the durations is extremely low. Therefore, no cumulative effects would occur.

Phase 3 of the SCF APT would involve pumping all of the constructed test-production wells during the two irrigations seasons following completion of the Phase 1 and 2 testing and equipping of the wells. Potential cumulative effects associated with Phase 3 of the SCF APT are:

1. Declines in groundwater levels that negatively affect neighboring wells or appear to be indicative of long-term (multi-year) reductions in groundwater storage.
2. Changes in groundwater or surface water quality brought on by the proposed project
3. Increases in the rate of inelastic land subsidence.

The monitoring and mitigation included in the proposed action would ensure that potential effects do not reach a level where harm would occur to third parties or to groundwater.

Because the Proposed Action would be of limited duration (2 years) and would represent only a small increase (2%) in regional annual average groundwater pumping from the basin during the active portion of the test, and would be modified or terminated based on monitoring data to avoid significant adverse impacts to groundwater including water quality and land subsidence, there would be no cumulative impacts to groundwater resources as a result of the proposed action.

When added to past, present and future foreseeable actions, the APT would contribute a minor increase in groundwater production (2%) for two years. Private wells and local municipalities in and near the study area would continue to utilize groundwater during the proposed action. Most, if not all of the private and local wells would be pumping from water bearing strata in the upper aquifer formation, not at the same depths as the proposed wells. Based on previous test-production well 22N02W02J001M results from Spring 2007, it is not anticipated that pumping during the APT would affect the upper aquifer system (Upper Tehama). Groundwater levels would be carefully monitored to assess and mitigate any effects to private and local water users.

The Sacramento Valley Water Management Plan, or Phase 8, is a future foreseeable project. However, Phase 8 is only in the planning and modeling stages and would not be implemented concurrently with the APT.

3.3 *Land Use*

3.3.1 Affected Environment

Land use within the test area is primarily for irrigated agriculture and waterfowl habitat. Principal crops include rice, orchards, alfalfa, and a variety of other field and forage crops. Willows and Orland are the two largest communities lying within or near the test area, each having populations of slightly more than about 6,500 in 2000 (U.S. Census Bureau). The total population of Glenn County was 26,453 in 2000.

3.3.2 Environmental Consequences

3.3.2.1 No Action

Under the No Action alternative, ongoing land use (agriculture) would continue in the APT study area.

3.3.2.2 Proposed Action

Under the Proposed Action alternative, construction of each test-production well would occur within an area of approximately 100 feet by 100 feet (0.23 acres) and the completed test-production well facilities would occupy a smaller area within the construction zone.

The total land area affected by test-production well construction would be approximately 0.001 percent of the land area served by the SCF Partners. Changes in land use would not occur as a result of the Proposed Action. Therefore, the Proposed Action would not impact existing land use.

3.3.2.3 Cumulative Impacts

Since the Proposed Action would not impact existing land use, it would not contribute to cumulative impacts on land use.

3.4 *Air Quality*

3.4.1 Affected Environment

The APT study area falls within the Sacramento Valley Air Basin (SVAB) as designated by the California Air Resources Board, which is administered by the Glenn County Air Pollution Control District. The SVAB includes all or portions of 11 counties, including all of Butte, Colusa, Glenn and Tehama Counties. The basin is bounded on the east, west and north by mountains that restrict air movement, sometimes resulting in the accumulation of air pollutants. When air stagnates in the basin, air pollution levels can accumulate to unhealthy levels. In 2000, the California 8-hour ozone standard was exceeded on 42 days and the PM10 standard was exceeded on 45 days (California Air Resources Board website). Carbon monoxide standards were not exceeded. On-road motor vehicles are the largest source of smog forming air pollution emissions in the basin.

The air quality attainment status of the four counties closest to the test area is summarized in Table 5.

Table 5. Status of Air Quality Attainment for Butte, Colusa, Glenn and Tehama Counties (Source: California Air Resources Board)

	Air Pollutant		
County	Ozone	PM10	Carbon Monoxide
Butte	Non-attainment	Non-attainment	Attainment
Colusa	Non-attainment-Transitional	Non-attainment	Unclassified
Glenn	Non-attainment-Transitional	Non-attainment	Unclassified
Tehama	Non-attainment	Non-attainment	Unclassified

3.4.2 Environmental Consequences

3.4.2.1 No Action

Under the No Action Alternative, there would be no change to existing air quality conditions, regulation, or attainment of standards.

3.4.2.2 Proposed Action

Under the Proposed Action, there would be temporary effects on air quality due to emission of air pollutants from diesel and gasoline powered equipment during the period of construction. Table 6 lists the type of equipment and hours of operation that would be used during the 3-day pilot hole drilling phase and the 9-day test production well construction phase. Prior to the project construction, the contractor to the project would be responsible for obtaining permits, if required, from the local Glenn County Air Pollution Control District. Combined, there is an estimated 789 hours of equipment operation required for the construction of the proposed wells. About 95% of the equipment operation is associated with diesel engines and the remainder with gasoline engines. All of the diesel engines burn road grade diesel except the Ingersol Rand air compressor which burns off-road diesel. Total fuel consumption during test hole drilling is estimated to be 400 gallons, and during well construction is estimated to be 1,200 gallons. There would be temporary emissions (impacts) resulting from the use of the construction equipment. The wells are electric and would not contribute any impacts to air quality in the proposed action area.

Table 6. Equipment and Estimated On-site Hours Operation for Well Construction (per well)

Equipment Description	Year Model	Engine Make	Engine Model	Fuel Type	Horsepower	Estimated Hours of Operation During Construction Period
Test Hole Drilling (3-day construction period)						
International Drill Rig	1999	Cummins	N14	Diesel	439	72
EDC Shaker	2001	Deutz Air Cooled	BF914	Diesel	98	68
Magnum Lite Tower	2003	Isuzu	3LB1	Diesel	26	36
					Subtotal hours of operation	176
Well Construction (9-day contruction period)						
Western Star Drill Rig	1991	LTA10 Cummins	LTA10	Diesel	265	200
Ingersol Rand Comp	2007	QSC 8.3 Cummins	QSA 8.3	Diesel	280	168
CAT 430 Backhe	2003	Caterpillar	3054C	Diesel	93	25
Magnum Lite Tower	2002	Isuzu		Diesel	26	100
Miller Welder DXL300	2000	Kubota	DH905B	Diesel	26	16
Miller Welder DXL300	2002	Kubota	DH905B	Diesel	26	16
Eaton Conveyor	2000	Case	4T390	Diesel	98	48
Eaton Conveyor	2000	Honda	6X390	Gasoline	13	24
Miller Bobcat Welder	2008	ONAN Engine	CH20	Gasoline	15	16
					Subtotal hours of operation	613
					Total hours of operation	789

3.4.2.3 Cumulative Impacts

Although there are temporary impacts to air quality resulting from the construction of the proposed test wells, the magnitude of those impacts together with the source, would not contribute to long term, cumulative impacts on air quality.

3.5 *Biological Resources*

3.5.1 Affected Environment

Agriculture

Agriculture, irrigated with water drawn from the Sacramento River, dominates the surrounding landscape. Principal crops include rice, orchards (walnut, almond, olive), alfalfa, and a variety of other field and forage crops. These crops are irrigated by either a series of canals (OUWUA and GCID) or through underground piping (OA) that delivers water from the Sacramento River or Stony Creek. The delivery canals within the action area are generally well maintained and concrete lined, and support minimal vegetation. There is one unlined drainage ditch which is lacking emergent aquatic vegetation such as cattails (*Typha latifolia*) and tules (*Scripus californicus*) that occurs in the vicinity of proposed well #5 (Appendix C Photo 7). All ditches owned and managed by SCF Partners are maintained throughout the year, and generally lack dense upland or aquatic vegetation.

All proposed action components are located in or adjacent to agriculture. The delivery canals that are proposed for conveyance of groundwater are surrounded by lands in active crop production. The Glenn-Colusa canal is not a lined canal, but supports a maximum flow capacity of 3,000 cfs. The water diverted from the Sacramento River into the Glenn-Colusa Canal moves through a state of the art fish screen facility, which prevents the entrainment of fish.

Wetland

There are no vernal pools or seasonal wetlands that occur within the proposed construction action areas. A search on the California Natural Diversity Database (CNDDB) indicated no presence of wetlands within the USGS 7.5 minute quadrangles of Kirkwood, Ord Ferry, Hamilton City, Foster Island, and Orland. These quadrangles encompass all of the well locations identified in the action area (BA Appendix A).

Riparian

There are no riparian habitats that occur in the proposed construction action areas. The closest riparian habitats would be the Stony Creek to the north of well #6, and the Sacramento River, north and east of the proposed action areas.

Developed/Disturbed

Developed and disturbed areas include major roads, highways, and buildings and structures within more urban areas, but also facilities and access roads which are located throughout agricultural areas near each proposed well location. Also included within this category are the unpaved turnouts and shoulders of dirt access roads.

Wildlife

The following list was obtained on June 10, 2008 by accessing the U.S. Fish and Wildlife database: http//www.fws.gov/sacramento/es/spp_list.htm (080411031358). This list is for the following 7 ½ minute U.S. Geological Survey quadrangles:

Ord Ferry (577B)
Hamilton City (578A)

Orland (578B)
Foster Island (594D)
Kirkwood (594C)

Listed Species

Invertebrates

- *Branchinecta conservatio*
    - Conservancy fairy shrimp (E)
- *Branchinecta lynchi*
    - vernal pool fairy shrimp (T)
- *Desmocerus californicus dimorphus*
    - valley elderberry longhorn beetle (T)
- *Lepidurus packardi*
    - vernal pool tadpole shrimp (E)

Fish

- *Acipenser medirostris*
    - green sturgeon (T) (NMFS)
- *Hypomesus transpacificus*
    - delta smelt (T)
- *Oncorhynchus mykiss*
    - Central Valley steelhead (T) (NMFS)
    - Critical habitat, Central Valley steelhead (X) (NMFS)
- *Oncorhynchus tshawytscha*
    - Central Valley spring-run chinook salmon (T) (NMFS)
    - Critical Habitat, Central Valley spring-run chinook (X) (NMFS)
    - Critical habitat, winter-run chinook salmon (X) (NMFS)
    - winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

- *Rana aurora draytonii*
    - California red-legged frog (T)

Reptiles

- ***Thamnophis gigas***
    - **giant garter snake (T)**

Candidate Species

Birds

- Coccyzus americanus occidentalis
    - Western yellow-billed cuckoo (C)

Although there are several species identified in the list, only those species that could potentially occur in the action area (proposed construction areas) are analyzed in detail. The giant garter snake (GGS) (*Thamnophis gigas*) is the only species with potential habitat in the action area.

3.5.2 Environmental Consequences

3.5.2.1 No Action

Under the no action alternative, conditions would remain the same as existing conditions. There would be no impacts to wildlife, including threatened and endangered species, their critical habitat, or general habitat types.

3.5.2.2 Proposed Action

The installation of test holes, production wells and the subsequent pumping and conveyance of groundwater would not affect aquatic species and/or their habitat. Habitat for Delta smelt, Chinook salmon (spring and winter run), central valley steelhead, or green sturgeon would not be affected, because no construction or flow modifications are proposed on natural waterways. All construction would tie into existing conveyance facilities (i.e. canals and underground pipes). The conveyance facilities to be used in the proposed action are not managed for fisheries. The groundwater pumped into the existing infrastructure would not be used outside the service areas of the SCF partners and would not impact species in the Sacramento River or Stony Creek. There would be no effect to federally listed fish species mentioned above and there would be no modification of critical habitat for the species as a result of the proposed action.

A biological assessment (BA) has been prepared under Section 7(a)(2) of the Endangered Species Act (ESA) for effects to the GGS (Appendix C). Reclamation has determined that the proposed action may affect, is not likely to adversely affect GGS. Potential effects to GGS or GGS habitat would be insignificant, due to the limited area and duration of disturbance under the proposed action. In addition, any impacts that may occur as a result of construction would be discountable or very unlikely, as only one proposed well site is located near potential habitat. The proposed location of well # 5 is near potential GGS habitat. However, California Natural Diversity Database search indicates no sighting of GGS in the action area (Appendix A Figure 1). The nearest CNDDB recorded sighting occurred in Ord Ferry, miles to the east of the proposed well #5 location.

During construction, avoidance and minimization measures would be followed to ensure minimal impacts to GGS. The measures include:

1. Avoid construction activities within the banks of potential GGS aquatic habitat. Confine movement of heavy equipment to existing roadways to minimize habitat disturbance.

2. Construction activity within known habitat areas should be conducted between May 1 and October 1. This is the active period for GGS and direct mortality is lessened because snakes are expected to actively move and avoid danger. Between October 2 and April 30 contact the Service's Sacramento Fish and Wildlife Office to determine if additional measures are necessary to minimize and avoid take.

3. Confine clearing to the minimal area necessary to facilitate construction activities. Flag and designate avoided GGS habitat within or adjacent to the project area as Environmentally Sensitive Areas. These areas should be avoided by all construction personnel.

4. Construction personnel would receive Service-approved worker environmental awareness training. This training instructs workers to recognize GGS and their habitat(s).

5. 24-hours prior to construction activities, the project area should be surveyed for GGS, by a Fish and Wildlife Service approved biologist. The survey of the project area would be repeated if a lapse in construction activity of two weeks or great has occurred. If a snake is encountered during construction, activities shall cease until appropriate corrective measures have been completed or it has been determined that the snake would not be harmed. Report any sightings and any incidental take to the Service immediately by telephone (916) 414-6620.

6. After completion of construction activities, remove any temporary fill and construction debris and, wherever feasible, restore disturbed areas to pre-project conditions.

3.5.2.3 Cumulative Impacts

Implementation of the proposed action would not result in cumulative effects to biological resources. Even though there may be potential impacts to potential GGS habitat, those impacts are determined insignificant and discountable, under Section 7 of the Endangered Species Act, and, therefore would not contribute to cumulative impacts when added to other past, present or future foreseeable actions carried out by any other federal, state or local agency.

3.6 *Indian Trust Assets*

3.6.1 Affected Environment

Indian Trust Assets (ITAs) are legal interests in property held in trust by the U.S. for federally-recognized Indian tribes or individual Indians. An Indian trust has three components: (1) the trustee, (2) the beneficiary, and (3) the trust asset. ITAs can include land, minerals, federally-reserved hunting and fishing rights, federally-reserved water rights, and in-stream flows associated with trust land. Beneficiaries of the Indian trust relationship are federally-recognized Indian tribes with trust land; the U.S. is the trustee. By definition, ITAs cannot be sold, leased, or otherwise encumbered without approval of the U.S. The characterization and application of the U.S. trust relationship have been defined by case law that interprets Congressional acts, executive orders, and historic treaty provisions.

Consistent with President William J. Clinton's 1994 memorandum, "Government-to-Government Relations with Native American Tribal Governments," Bureau of Reclamation (Reclamation) assesses the effect of its programs on tribal trust resources and federally-recognized tribal governments. Reclamation is tasked to actively engage federally-recognized tribal governments and consult with such tribes on government-to-government level (59 Federal Register 1994) when its actions affect ITAs. The U.S. Department of the Interior (DOI) Departmental Manual Part 512.2 ascribes the responsibility for ensuring protection of ITAs to the heads of bureaus and offices (DOI 1995). DOI is required to "protect and preserve Indian trust assets from loss, damage, unlawful alienation, waste, and depletion" (DOI 2000). Reclamation is responsible for assessing whether the proposed APT has the potential to affect ITAs.

It is the general policy of the DOI to perform its activities and programs in such a way as to protect ITAs and avoid adverse effects whenever possible. The SCF Partners' proposed APT would be implemented to ensure compliance with this policy. In addition, Reclamation would comply with procedures contained in Departmental Manual Part 512.2, guidelines, which protect ITAs.

The nearest ITA is the Paskenta Rancheria which is approximately 13 miles NW of the project location. In 2000, the Paskenta Band of Nomlaki Indians acquired a 2000-acre reservation near Corning and the construction of the Rolling Hills Casino on that Reservation. This ITA is located near the City of Corning in Tehama County, about 20 miles north of the APT study area.

3.6.2 Environmental Consequences

3.6.2.1 No Action

Under the no action alternative, there are no impacts to ITAs, as no new facilities would be constructed and existing operations would continue to operate as have historically occurred.

3.6.2.2 Proposed Action

There are no tribes possessing legal property interests held in trust by the United States in the water involved with this action, nor is there such a property interest in the lands designated to receive the water proposed in this action. The nearest ITA is the Paskenta Rancheria which is approximately 13 miles NW of the project location. There would be no impacts to ITAs as a result of Proposed Action.

3.6.2.3 Cumulative Effects

Because there are no impacts to ITAs as a result of the Proposed Action, the Proposed Action would not contribute to any cumulative impacts to ITAs.

3.7 *Environmental Justice*

3.7.1 Affected Environment

As mandated by Executive Order 12898 (E.O. 12898), published February 11, 1994, entitled, "Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations", this EA addresses potential environmental justice concerns. The population of some small communities in the Central Valley typically increases during late summer harvest. The market for seasonal workers on local farms draws significant numbers of migrant workers, commonly of Hispanic origin from Mexico and Central America.

3.7.2 Environmental Consequences

3.7.2.1 No Action

The No Action Alternative would have no impact on environmental justice. The SCF Partners would continue to manage their water supplies to meet the needs of water users within their respective service areas. Conditions would be the same as the existing conditions; therefore, no additional impacts are associated with this alternative.

3.7.2.2 Proposed Action

The Proposed Action involves a temporary test of the lower aquifer system and has no potential to affect the crops grown or the yields achieved on the irrigated land within the SCF Partners' service areas. The Proposed Action would not cause dislocation, changes in employment, or increase flood, drought, or disease. The Proposed Action would not disproportionately impact economically disadvantaged or minority populations. No impacts relevant to Environmental Justice are anticipated because the project does not result in any change in operations that would affect the general public or migrant workers.

3.7.2.3 Cumulative Effects

Because the Proposed Action would have no impact on minority or disadvantaged populations, it would not contribute to cumulative impacts on those populations. There would be no cumulative impacts to Environmental Justice as a result of the Proposed Action.

3.8 *Cultural Resources*

3.8.1 Affected Environment

This section discusses the identification of cultural resources and the potential for well installation to affect historic properties. The Orland Unit Water User's Association (OUWUA), Orland-Artois Water District (OAWD), and Glenn-Colusa Irrigation District (GCID) propose to install seven test-production wells in Glenn County. The area of potential effects (APE) for cultural resources was determined to be an area measuring 100-foot by 100-foot at each of the seven test-production well sites (Table 4). Proposed well locations 1-4 have previously been drilled in preparation for installing a test-production well. Well locations 5-7 are proposed for test drilling to determine if they are suitable sites for test-production wells.

Table 4 Location of Test-Production Wells

	Location	Quadrangle	Facility
Well 1	NW¼NW¼ Sec. 18, T. 22 N., R. 2 W.	Kirkwood	Lateral 130, Orland Unit
Well 2	NW¼NW¼ Sec. 29, T. 22 N., R. 2 W.	Hamilton City	Lateral 60, Orland Unit
Well 3	NE¼NE¼ Sec. 30, T. 22 N., R. 2 W.	Orland	N of Road 20 in abandoned orchard tie to concrete sub-lateral? OAWD
Well 4	NW¼NE¼, Sec. 4, T. 21 N., R. 2 W.	Hamilton City	in almond orchard-what conveyance? OAWD
Well 5	unsectioned, T. 21 N., R. 1 W	Hamilton City	Glenn-Colusa Canal, GCID between berms of GCC and rice fields
Well 6	unsectioned, T. 21 N., R. 1 W	Hamilton City	Glenn-Colusa Canal, GCID berm at Stoney Creek siphon
Well 7	unsectioned, T. 22 N., R. 1 W	Hamilton City	Glenn-Colusa Canal, GCID on berm/ road

The Orland Project was authorized by the Secretary of the Interior in October 1907. The project incorporates parts of Glenn, Tehama, and Colusa Counties. The hub of the project is the town of Orland in northern Glenn County. The Orland Project is irrigated by Stony Creek, a tributary of the Sacramento River that drains the east side of the North Coast Range and comprises two main dams to store water (East Park and Stony Gorge), two diversion dams (Rainbow and Northside), 17 miles of canals, and 139 miles of laterals. The OUWUA has operated the project since October 1, 1954.

The OAWD was formed in 1954 for the purpose of contracting with Reclamation for a supplemental surface water supply from the CVP. The District consists of 28,988 gross acres interspersed with non-District lands in a checkerboard-like pattern. The OAWD water distribution system was constructed between 1976 and 1983 and consists of about 100 miles of buried pipelines ranging in diameter from 8 to 96 inches. The system is supplied from five permanent and three temporary turnouts on the Tehama-Colusa Canal (TCC).

The GCID (formerly the Central Irrigation District) was organized November 22, 1887, becoming the fourth irrigation district organized under the Wright Act of March 1887 (Davis 1984:10). Due to a great deal of litigation over water rights, financial constraints, and other impediments such as marketing irrigation water, the Central Irrigation District subsequently went through several management companies. Central Irrigation District was invalidated in 1893 as a consequence of a legal technicality (Davis 1984:16). The Central Canal and Irrigation Company took over the irrigation system, followed by the Sacramento Valley Irrigation Company and Sacramento Valley West Side Canal Company. The Glenn-Colusa Irrigation District was formed in 1919 and began official operations on March 1, 1920. The GCID owns, operates, and delivers water through the 65-mile-long Glenn-Colusa Canal (GCC) into a complex system of over 900 miles of laterals and drains.

The only cultural resources identified within the APE are Orland Lateral 130, Orland Lateral 60, and the Glenn-Colusa Canal. Lateral 130 is a lateral of the North Canal, which originates at the

Northside Diversion Dam. Northside Diversion Dam, completed in 1913, is on Stony Creek about 5 miles northwest of Orland (Reclamation 1961:574). Lateral 130 diverges to the south from the North Canal west of I-5 and is approximately 8.5 miles long. Lateral 60 is a sub-lateral of Lateral 40, which extends eastward from the South Canal in central Orland. Both Lateral 130 and Lateral 60 are lined with concrete. These two laterals have not be formally recorded or evaluated for NRHP eligibility.

The Glenn-Colusa Canal (GCC) is the main canal, and one of the first facilities built, within GCID. Construction of the GCC (formerly the Central Canal) was begun November 9, 1889 (Davis 1984:12). By November 1891, forty miles of the 65 miles of canal had been excavated before construction was halted. The Central Canal and Irrigation Company continued construction in 1904 and completed the Central Canal in 1908 (Davis 1984:19-20). The canal was designed to be about 6 feet deep with a bottom width of approximately 65 feet. The GCC has not been formally evaluated for NRHP eligibility.

Regulatory Setting

National Historic Preservation Act

The NHPA of 1966, as amended (16 USC 470 *et seq.*), is the primary Federal legislation that outlines the Federal Governments' responsibility to consider the effects of their actions on historic properties. The 36 CFR Part 800 regulations that implement Section 106 of the NHPA describe how Federal agencies address these effects. Historic properties are defined as those cultural resources listed, or eligible for listing, on the National Register of Historic Places. The term "cultural resources" is used to describe archaeological sites, illustrating evidence of past human use of the landscape; the built environment, represented by structures such as dams, roadways, and buildings; and resources of religious and cultural significance, including, but not limited to, structures, objects, districts, and sites. Historic properties include Traditional Cultural Places, which are resources of religious and cultural significance that are eligible for the NRHP by virtue of their traditional significance.

The criteria for National Register eligibility is outlined at 36 CFR Part 60. These criteria state that the "quality of significance in American history, architecture, archeology, engineering, and culture" must first be demonstrated by the property's "integrity of location, design, setting, materials, workmanship, feeling, and association." Additionally, in order to be a historic property, a "district, site, building, structure, or object" must meet at least one of the following four criteria.

(A) be associated with events that have made a significant contribution to the broad patterns of our history; or

(B) be associated with the lives of persons significant in our past; or

(C) embody distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

(D) have yielded, or may be likely to yield, information important in prehistory or history.

If a cultural resource meets one of these criteria and has integrity, it is considered eligible for listing on the NRHP and, therefore, a “historic property.”

Determination of Eligibility

Orland Laterals 130 and 60 have not been formally determined eligible for listing on the NRHP. Little of the Orland Project has been evaluated for its eligibility for inclusion on the National Register of Historic Places. Stony Gorge Dam is the only component that has been determined eligible for inclusion on the National Register under Criteria A and C. A project-wide evaluation of eligibility for the Orland Project has not yet been implemented due to funding constraints. Reclamation recognizes the significance of the Orland Project, the first federal water project entirely within California, as it applies to the themes of water conveyance and the development of agriculture in the west and, more specifically, in the northern Central Valley of California.

Reclamation’s cultural resource staff is actively seeking funds to conduct a project wide determination of eligibility and historic context that would lead to a National Register nomination. In the interim, Reclamation assumes, for the purposes of this undertaking, that the Orland Project is eligible for inclusion in the National Register under Criterion A. Lateral 130 and Lateral 60 are assumed eligible as contributing features of the Orland Project pursuant to 36 CFR Part 60.4.

Reclamation determined that evaluating the GCC for listing on the NRHP is outside the scope of this undertaking. Therefore, for the purposes of this undertaking, Reclamation also assumes that the GCC is eligible for listing on the NRHP under Criterion A for its association with the early agricultural and economic development of Glenn County and the Sacramento Valley pursuant to 36 CFR Part 60.4.

3.8.2 Environmental Consequence

3.8.2.1 No action

The no action alternative would result in no historic properties affected pursuant to 36 CFR Part 800.4(d)(1).

3.8.2.2 Proposed action

The proposed installation of test-production wells 1-4 has no potential to affect historic properties pursuant to 36 CFR Part 800.3(a)(1). These test-production wells would be installed at sites previously drilled to determine if the sites were suitable for the wells.

The proposed installation of test production wells 5-7 would result in no adverse impacts to historic properties pursuant to 36 CFR Part 800.5(b). The proposed test drilling would not affect the qualities and characteristics that make the Glenn-Colusa Canal eligible for listing on the NRHP.

Reclamation’s has consulted with the California Office of Historic Preservation (SHPO). SHPO concurred with Reclamation’s findings and determinations (Appendix)

Section 4 Consultation and Coordination

The CEQA document prepared by GCID, as appended hereto, was filed with the State Clearinghouse and the County Clerk for Glenn County in November 2007, and otherwise made available for public review. During preparation of this environmental assessment, the following agencies were coordinated with and/or assisted in preparing the document:

- U.S. Fish and Wildlife Service (Service)
- Glenn Colusa Irrigation District
- Orland-Artois Water District
- Orland Unit Water Users Association
- State of California Historic Preservation Office (SHPO)

Reclamation has consulted with the Service pursuant to the Endangered Species Act (ESA) for this action. ESA consultation with the FWS was initiated August 2008. Reclamation received a concurrence letter from FWS on September 25, 2008. (Appendix C)

Reclamation has consulted with SHPO pursuant to Section 106 of the National Historic Preservation Act (NHPA). Section 106 supporting information from the SHPO consultation, as well as the concurrence letter, can be found in Appendix F.

Section 5 List of Preparers and Reviewers

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